TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

[Vol. 4]

Twenty-First Annual Meeting.

NEW LONDON, CONN., 1885.

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MEMBERS

OF THE

AMERICAN OPHTHALMOLOGICAL SOCIETY,

1885-86.

ACTIVE MEMBERS.

Dr. F. W. Abbott.....Buffalo, N. Y.
Dr. C. R. Agnew .....New York, N. Y.
Dr. A. Alt .....St. Louis, Mo.
Dr. J. A. Andrews.....New York, N. Y.
Dr. Joseph Aub.....Cincinnati, O.
Dr. S. C. Ayres .....Cincinnati, O.
Dr. William T. Bacon ... .Hartford, Conn.
Dr. Edwin W. Bartlett.....Milwaukee, Wis.
Dr. H. W. Bradford .....Boston, Mass.
Dr. Charles S. Bull.....New York, N. Y.
Dr. F. Buller .....Montreal, Canada.
Dr. Swan M. Burnett.....Washington, D. C.
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Dr. Abram Du Bois..... .....New York, N. Y.

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Dr. Edwin Hutchinson.....Utica, N. Y.
Dr. Edward Jackson.....Philadelphia, Pa.
Dr. B. Joy Jeffries.....Boston, Mass.
Dr. Samuel J. Jones .....Chicago, Ill.
Dr. Charles J. Kipp ..... Newark, N. J.
Dr. H. Knapp.....New York, N. Y.
Dr. J. A. Lippincott.....Pittsburgh, Pa.
Dr. W. S. Little.....Philadelphia, Pa.
Dr. Edward G. Loring.....New York, N. Y.
Dr. F. B. Loring.....Washington, D. C.
Dr. W. V. Marmion.....Washington, D. C.
Dr. Arthur Matthewson.....Brooklyn, N. Y.
Dr. S. F. McFarland.....Binghamton, N. Y.
Dr. R. J. McKay.....Wilmington, Del.
Dr. C. S. Merrill.....Albany, N. Y.
Dr. H. G. Miller.....Providence, R. I.
Dr. J. Lancelot Minor .....New York, N. Y.
Dr. W. F. Mittendorf.....New York, N. Y.
Dr. William O. Moore.....New York, N. Y.
Dr. Russell Murdoch.....Baltimore, Md.
Dr. William F. Norris.....Philadelphia, Pa.
Dr. Henry D. Noyes.....New York, N. Y.
Dr. J. F. Noyes.....Detroit, Mich.
Dr. Charles A. Oliver.....Philadelphia, Pa.
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Dr. Thomas R. Pooley.....New York, N. Y.
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Dr. B. Alexander Randall.....Philadelphia, Pa.

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Dr. Charles E. Rider.....Rochester, N. Y.
Dr. Samuel D. Risley.....Philadelphia, Pa.
Dr. D. B. St. John Roosa.....New York, N. Y.
Dr. Jno. D. Rushmore.....Brooklyn, N. Y.
Dr. Robert Sattler.....Cincinnati, O.
Dr. H. S. Schell.....Philadelphia, Pa.
Dr. W. W. Seely.....Cincinnati, O.
Dr. Henry L. Shaw.....Boston, Mass.
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Dr. A. G. Sinclair.....Memphis, Tenn.
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Dr. George T. Stevens.....New York, N. Y.
Dr. Samuel B. St. John.....Hartford, Conn.
Dr. George Strawbridge.....Philadelphia, Pa.
Dr. Samuel Theobald.....Baltimore, Md.
Dr. William Thompson.....Philadelphia, Pa.
Dr. John Van Duyn.....Syracuse, N. Y.
Dr. J. J. B. Vermyne.....New Bedford, Mass.
Dr. O. F. Wadsworth.....Boston, Mass.
Dr. Leroy Pope Walker.....New York, N. Y.
Dr. David Webster.....New York, N. Y.
Dr. Robert Willard.....Boston, Mass.
Dr. Charles H. Williams.....Boston, Mass.
Dr. E. Williams.....Cincinnati, O.
Dr. Henry W. Williams.....Boston, Mass.
Dr. J. P. Worrell.....Terre Haute, Ind.

Total.....94.

HONORARY MEMBERS.

Dr. G. A. Bethune.....Boston, Mass.
Dr. C. Schweigger.....Berlin, Prussia.

Total.....2.
Whole Number.....96.

CONSTITUTION.

1.—Name.

This Association shall be called the "American Ophthalmological Society."

2.—Objects.

The purpose of this Society shall be the advancement of Ophthalmic Science and Art.

3.—Members.

The members shall be graduates in medicine, in good professional standing, who have an interest in Ophthalmic Science and Art. No member shall attach or suffer to be attached to his name, in any public manner, the title of "oculist," or any similar title, or shall announce in print that he gives special or exclusive attention to special practice.

Candidates for membership shall have been engaged in the practice of ophthalmic surgery for at least five years, shall have given evidence of satisfactory scientific attainments, and shall have conducted themselves in conformity with the ethical rules of this Society.

BY-LAWS.

1.—Election of Members.

There shall be a Committee on Membership consisting of five.

All nominations shall be made in open meeting by two members of the Society, and shall be referred to the Committee on Membership, who may report on each name as they shall think proper; such report to be made at the next annual meeting following that at which the nomination is made. But the proposers of any name may, after the report of this Committee has been received, bring such name before the Society. The Secretary shall, soon after each annual meeting, send to each member of the Society a list of the names of all candidates proposed for membership, together with the names of proposers and of the members of the Committee on Membership.

A vote of three-fourths of the members present at an annual meeting shall be requisite to election.

The election shall be by ballot.

Every member shall sign the Constitution and By-Laws.

Honorary members may be chosen to the Society in the same manner as active members. They shall enjoy all the privileges of active members, except voting and election to office and appointment on business Committees. They shall, if practicable, sign the Constitution and By-Laws.

2.—Officers.

The officers shall be a President, Vice-President and Recording Secretary, who shall also be Treasurer: their terms of office shall be for one year. There shall be a Corresponding Secretary, whose term of office shall continue from year to year, unless limited by the Society.

The President shall conduct the meetings of the Society.

The Recording Secretary shall keep the minutes, carry out the instructions of the Society in respect to its transactions, and call its meetings. He shall also take charge of moneys for the Society.

The Corresponding Secretary shall conduct all foreign correspondence.

The President and Recording Secretary shall be elected at the close of each annual meeting, to manage the affairs of the Society during the interim, and to serve at its ensuing meeting.

3.—Meetings.

The Society shall hold its meetings annually, on the third Wednesday of July, at such place as may be determined; the time and place of meetings to be advertised by the Secretary, and notices to be sent to members. Eight members shall constitute a quorum.

4.—Proceedings.

The proceedings of the Society shall be issued in pamphlet form.

There shall be a Publication Committee of two, to act in connection with the Recording Secretary in publishing the transactions.

5.—Expulsion of Members.

Any member may be expelled for cause by a three-fourths vote of those present at any annual meeting.

No action in matters of discipline shall be taken at any session of an annual meeting at which there shall be present less than three-fourths of the members registered as attending such annual meeting. A vote of three-fourths of the number thus present shall be necessary for expulsion.

6.—Order of Business at Annual Meetings.

1.—Reading Records of Previous Meetings.
2.—Appointment of Committees.
3.—Report of Treasurer.
4.—Report of Committees.
5.—Election of New Members.
6.—Written Communications.
7.—Stated Discussions.
8.—Verbal Communications.
9.—Incidental Business.

7.—Alterations of By-Laws.

A vote of three-fourths of the members present at any annual meeting shall be requisite for an alteration of the Constitution.

A vote of a majority of the members present at an annual meeting shall be requisite for an alteration of the By-Laws.

Propositions to amend or alter the Constitution or By-Laws must be made at one session of the annual meeting, and acted upon at a subsequent session of the same annual meeting.

STANDING RULES.

I.—Whenever a candidate is proposed for membership, both the proposer and seconder shall furnish letters setting forth the claims of such candidate for membership.

II.—Names of members in arrears to the Society for three years shall be stricken from the list, except in the case of those absent from the country, three months after notification of this rule has been served upon such members.

III.—The Secretary shall, about June 1st, send a request to each member to forward the titles of such papers as he desires to present at the next meeting of the Society. Such titles shall be incorporated by the Secretary in the printed call for the meeting, and these papers shall have precedence over all others.

IV.—Twenty minutes shall be the maximum time to be allotted to the reading of any paper, unless by special vote of the Society in each case and by a two-thirds majority. Any paper requiring more than twenty minutes for its reading shall be presented in abstract under the same limitation to twenty minutes.

V.—No paper shall be referred to the Publishing Committee unless the paper itself, or an abstract of it, shall have been presented to the Society at its annual meeting by the author in person.

VI.—All papers and other communications intended for publication shall be placed in the hands of the Secretary before September 15th; proofs of the same shall be sent to the several writers, returnable within one week. In case of non-compliance with this rule, any paper may be omitted from the published transactions at the discretion of the Publishing Committee.

MINUTES OF THE PROCEEDINGS.

TWENTY-FIRST ANNUAL MEETING.

PEQUOT HOUSE,
NEW LONDON, *July 15, 1885.*

THE Twenty-First Annual Meeting of the Society was called to order at 10 A.M., by the President, DR. WM. F. NORRIS. Committees were appointed as follows:

Committee on Bulletin—DRS. H. G. MILLER and J. S. PROUT.

Auditing Committee—DR. B. E. FRYER.

Committee on Membership—DRS. JOHN GREEN, GEO. C. HARLAN, ARTHUR MATHEWSON, SAMUEL THEOBALD, J. J. B. VERMYNE.

The Treasurer's Report was read and referred to the Auditing Committee.

Permission to furnish an abstract of the proceedings to the Medical Journals was granted, such abstract to be submitted to the Secretary before printing.

The Committee on Bulletin reported. The first paper was:

1. "An Operation for the Removal of a Dislocated Crystalline Lens," by Dr. C. R. Agnew.

2. "Extraction of a Dislocated Lens from an Eye with the Aid of Dr. Agnew's Bident," by Dr. David Webster. Discussed by Drs. Knapp, E. Williams, Agnew, Webster and H. W. Williams.

3. "Remarks on the Extraction of the Lens in its Capsule," by Dr. D. B. St. John Roosa. Discussed by Drs. Carmalt and Dyer.

4. "Two Cases of Subconjunctival Luxation of the Lens," by Dr. G. C. Harlan.

5. "Case of Luxation of Lens Beneath Tenon's Capsule," by Dr. O. F. Wadsworth.

6. "Treatment of Purulent Conjunctivitis," by Dr. J. A. Andrews.

7. Abscess of both Frontal Sinuses, and of Ethmoid Bone, Operation and Complete Recovery, by Dr. C. S. Bull. Discussed by Dr. Knapp.

8. "Melanotic Sarcoma of Orbit, by Dr. F. Buller.

9. "Bony Tumor of Orbit (Cystic) Caused by and Enclosing Foreign Body," by Dr. B. E. Fryer. Discussed by Drs. Carmalt, Knapp, Dyer, Kipp and Harlan.

The Auditing Committee reported the Treasurer's report to be correct, and it was accepted and ordered to be placed on file.

10. "A New Test Type," by Dr. W. S. Dennett.

11. "A New Sheet of Metric Test Letters with Explanatory Remarks," by Dr. Chas. A. Oliver, read by Dr. Wm. F. Norris.

12. "A Case of Occasional or Simulated Blindness," by Dr. C. R. Agnew. Discussed by Drs. Andrews, Theobald, Buller, Roosa, Webster, Harlan, E. Williams, Risley, and H. W. Williams.

13. "Consideration of Some of the Results Obtained in the Compilation of a First Series of 1000 Cases of Refraction," by Dr. E. E. Holt.

14. "Rapidly Progressive Myopia, Permanently Checked by Section of External Rectus," by Dr. G. C. Harlan.

15. "Notes of Three Cases of Progressive Astigmatism," by Dr. S. Theobald.

Adjourned to 4 P.M.

The Meeting was called to order at 4 P.M. Records of preceding session read and accepted.

Drs. Murphy and Sutphen were invited to attend the Meeting of the Society. Reading of papers resumed.

16. Demonstration by Dr. Wm. F. Norris of "An Instrument for Measuring the Color-Sense," by Dr. Chas. A. Oliver.

17. "Hypermetropic Passing into Myopic Refraction," by Dr. S. D. Risley. Discussed by Dr. Seely.

18. Demonstration of "An Instrument for the Determination of Spectacles," by Dr. W. S. Dennett.

19. Demonstration of "An Electric Light Ophthalmoscope," by Dr. W. S. Dennett.

20. Demonstration of "An Arrangement for Demonstrating Refraction and Accommodation," by Dr. L. Howe.

21. Demonstration of "A Perimeter," by Dr. E. Dyer.

22. "Two Cases of Unilateral Temporal Hemianopia," by Dr. C. S. Bull. Discussed by Drs. Knapp, St. John and Webster.

23. "Two Cases of Penetration of the Eyeball by Scissors During the Operation for Strabismus," by Dr. H. Derby. Discussed by Drs. Webster, Knapp, Mittendorf, E. Williams, Risley, Buller, Fox and Andrews.

24. "Strabismus; Its Correction when Excessive and in High Degrees of Amblyopia," by Dr. E. E. Holt.

25. "Treatment of Strabismus Internus," by Dr. W. W. Seely. Discussed by Drs. Kipp, Knapp, Theobald, Wadsworth, Bull and Prout.

26. "Ectropion of both Lids; Blepharoplasty by the Italian Method," by Dr. R. H. Derby. Discussed by Drs. Howe, Fryer and Mittendorf.

27. Demonstration of "A Case of Trial Lenses," by Dr. H. Derby.

28. "Some Suggestions in Plastic Operations Without a Pedicle," by Dr. B. Joy Jeffries. Discussed by Dr. Webster.

Adjourned to 8.30 P.M.

Meeting called to order at 8.30 P.M.

29. "Congenital Hereditary Paresis of the External Recti," by Dr. G. C. Harlan.

30. Demonstration of "Borsch's Sphero-Cylindrical Lenses," by Dr. G. C. Harlan. Discussed by Dr. Knapp.

31. "Case of Successful Removal of a Bit of Steel from the Lens with the Electro-Magnet," by Dr. J. L. Minor.

32. "Case of Malformation of the Upper Lid," by Dr. R. H. Derby.

33. "Case of Epithelioma of Eyelid, Removed by Applications of Benzole and Calomel," by Dr. A. Mathewson.

34. "Lipomatous Ptosis," by Dr. H. S. Schell.

35. "Clinical Observations," by Dr. L. W. Fox. Discussed by Drs. Dennett, R. H. Derby, Roosa, Knapp and Carmalt.

36. "On the Pulsating Variations of Intraocular Tension, as Shown by the Manometer," by Dr. L. Howe. Discussed by Dr. Andrews.

37. "Nine Successive Cases in which the Electro-Magnet was Used for the Extraction of Pieces of Iron from the Eye," by Dr. H. Knapp.

38. "On the Actual Cautery in Destructive Corneal Processes," by Dr. H. Knapp. Discussed by Drs. Howe, E. Williams and Wadsworth.

Adjourned to 9 A.M., July 16th.

July 16th.

The Meeting was called to order at 9 A.M.

Reading of papers resumed.

39. "Pneumophthalmos, or Air in the Vitreous Humor," by W. F. Mittendorf. Discussed by Drs. Knapp, Buller and Dennett.

40. "Case of Tuberculosis of the Iris," by Dr. Myles Standish. Discussed by Drs. Knapp, Wadsworth, Mittendorf, Callan, Webster, Seely and Norris.

41. "A Case of Congenital Coloboma of Iris, Choroid and Retina, in which Inflammatory Glaucoma Developed late in Life; with Anatomical Description of the Eye," by Dr. C. J. Kipp. Discussed by Dr. Mittendorf.

42. "An Additional Case of Effusion (Serous) into the Vitreous Humor, Due to Malaria," by Dr. W. W. Seely.

43. "On the Association of Gray Degeneration of the

Optic Nerves with Abnormal Patellar-Tendon Reflexes," by Dr. W. F. Norris. Discussed by Dr. Knapp.

44. "Case of Double Optic Neuritis and Ophthalmoplegia from Lead Poisoning, Complicated with Typhoid Fever," by Dr. O. F. Wadsworth. Discussed by Dr. Roosa.

45. "Olive Oil as a Menstruum for Dissolving Cocaine," by Dr. J. A. Andrews.

46. "A Case in which the Enucleation of an Eye for Glaucoma Absolutum Precipitated an Attack of Acute Glaucoma in the other Eye," by Dr. D. Webster.

47. "Quinine Amaurosis. Report of Two Cases," by Dr. E. Williams. Discussed by Drs. Roosa and Buller.

48. "Method of Obtaining a Measure of the Degree of Anæsthesia Produced by Cocaine," by Dr. L. Howe.

49. "A New Ophthalmoscope," by Dr. E. Jackson, presented by Dr. G. C. Harlan.

50. "The Stokes Lens for Measuring Astigmatism," by Dr. W. S. Dennett.

On motion of Dr. Jeffries it was voted that Committees be appointed by the Chair to prepare obituary notices of the late Drs. John H. Dix and E. T. Ely, for the Transactions.

At 11.15 A.M. the Society went into executive session.

Dr. Green, for the Committee on Membership, recommended the following candidates for election: Dr. Edward Jackson, of Philadelphia, Pa.; Dr. B. Alexander Randall, Philadelphia, Pa.; Dr. Leroy Pope Walker, New York, N. Y.; Dr. Franklin G. Capron, Providence, R. I.; Dr. Wm. O. Moore, New York, N. Y.; Dr. Swan M. Burnett, Washington, D. C.; Dr. Wm. T. Bacon, Hartford, Conn. These gentlemen were elected.

Dr. Jeffries moved the following vote, which was passed:

Voted,—That the Society would again express most hearty approval of the International Commission twice recommended in a bill reported by the Naval Committee of Congress, and endorsed by the International Medical Congress, London, 1881; to consider

and agree upon standard colored lights and signals, etc., and the visual power and color sense of officers and sailors.

The Society would particularly support the International Congress vote that, "every government, especially the maritime governments, should be requested to place one or more members on the commission, and chiefly experienced naval officers and medical specialists."

The Secretary is hereby directed to transmit this vote to Congress.

The President appointed Drs. E. G. Loring and H. Derby to prepare an obituary notice of the late Dr. John H. Dix, and Dr. J. A. Andrews to prepare an obituary notice of the late Dr. E. T. Ely.

Dr. Theobald moved the following resolution, which, after discussion, was adopted by vote.

Resolved,—That it is the sense of the American Ophthalmological Society, that the action of the American Medical Association at its late meeting in New Orleans, and of the enlarged Committee appointed at that time to make arrangements for the International Medical Congress, in overturning much of the carefully planned work of the original Committee appointed at Washington for that purpose, was unwise, and not to be defended, unless, possibly, upon technical grounds; and this Society hopes that none of its members will endorse the action of the enlarged Committee by accepting official positions at its hands.

On motion of Dr. Webster,

Voted,—That the words "by the author in person" be added to the end of the rule passed July 26, 1882, regulating the reference of papers to the Publishing Committee.

Voted,—That a reprint of the Constitution, By-laws and Standing Rules of the Society be published in the Transactions and separately.

Dr. Green moved to amend By-law 4 by omitting all that part of the first paragraph occurring after the word "form."

The Meeting adjourned for one minute.

The Meeting was called to order again, and the amendment was passed.

The Committee on Membership proposed the following officers for the ensuing year, and they were elected by ballot:

President—Dr. WILLIAM F. NORRIS.
Vice-President—Dr. H. DERBY.
Recording Secretary and Treasurer—Dr. O. F. WADSWORTH.
Corresponding Secretary—Dr. J. S. PROUT.
Publishing Committee—Drs. G. HAY and H. DERBY.

On recommendation of the Committee it was voted to hold the next Annual Meeting at the Pequot House, New London.

Adjourned.

Present at the Twenty-first Annual Meeting.

Dr. C. R. AGNEW.
Dr. J. A. ANDREWS.
Dr. EDWIN W. BARTLETT.
Dr. CHARLES S. BULL.
Dr. F. BULLER.
Dr. PETER A. CALLAN.
Dr. W. H. CARMALT.
Dr. W. S. DENNETT.
Dr. HASKET DERBY.
Dr. RICHARD H. DERBY.
Dr. LEWIS S. DIXON.
Dr. E. DYER.
Dr. L. WEBSTER FOX.
Dr. B. E. FRYER.
Dr. JOHN GREEN.
Dr. GEORGE C. HARLAN.
Dr. E. E. HOLT.
Dr. LUCIEN HOWE.
Dr. B. JOY JEFFRIES.
Dr. CHARLES J. KIPP.
Dr. H. KNAPP.
Dr. EDWARD G. LORING.
Dr. ARTHUR MATHEWSON.
Dr. C. S. MERRILL.
Dr. H. G. MILLER.
Dr. J. LANCELOT MINOR.
Dr. W. F. MITTENDORF.
Dr. WILLIAM F. NORRIS.
Dr. J. S. PROUT.
Dr. SAMUEL D. RISLEY.
Dr. D. B. ST. JOHN ROOSA.
Dr. H. S. SCHELL.
Dr. W. W. SEELY.
Dr. MYLES STANDISH.
Dr. SAMUEL B. ST. JOHN.
Dr. SAMUEL THEOBALD.
Dr. WILLIAM THOMSON.
Dr. JOHN VAN DUYN.
Dr. J. J. B. VERMYNE.
Dr. O. F. WADSWORTH.
Dr. DAVID WEBSTER.
Dr. E. WILLIAMS.
Dr. HENRY W. WILLIAMS.

Present by invitation:
Dr. T. Y. SUTPHEN; Dr. MURPHY.

O. F. WADSWORTH, M.D.,
Recording Secretary.

ABSCESS OF BOTH FRONTAL SINUSES AND OF ETHMOID BONE—OPERATION AND COMPLETE RECOVERY.

BY CHARLES STEDMAN BULL, M.D.,
NEW YORK.

THE following case of abscess of both frontal sinuses and of the ethmoid bone is presented not only on account of its comparative rarity and extensive absorption of bone tissue, but also on account of the long time which elapsed between the occurrence of the injury and the appearance of permanent distension of the sinus, as well as the very rapid recovery.

Jane L., aged fifty-three, a widow, presented herself for treatment on Oct. 27th, 1884. Fourteen years before, while engaged in chopping wood, a piece of large size struck her on the bridge of the nose and median line of the forehead, with such force as to knock her down. It made an ugly lacerated wound about three inches long, running from a point a little to the right of the median line of the forehead and midway between the superior orbital margin and the hairy scalp, downwards to the left, across the bridge of the nose, and ending at the end of the left nasal bone on the side of the nose. There was a fracture of both nasal bones, and a slight deviation of the septum to the right side. There was considerable swelling produced in the soft parts, the right eye was entirely closed by infiltration into the eyelids, and there was a rather profuse purulent discharge from the wound for several weeks. The wound itself did not close for about seven weeks. Since then the patient has at times suffered from a sense of distension or pressure over the eyes, which, after lasting a few days, would subside. Nothing unusual occurred until about four years ago, when the patient first noticed a somewhat hard, elastic swelling at the upper and inner angle of the right orbit, which at first could by pressure be caused to disappear,

but which gradually increased in size, extended downwards and along the superior orbital margin, outwards towards the temple, until the eye was entirely closed by the swelling and the complete ptosis. At somewhat long intervals, there would be all the signs of an acute inflammation in the lid and neighboring tissues accompanied by great pain, but these symptoms always subsided under the application of continuous heat.

When I first saw the patient, there was complete ptosis of the right upper lid, but without any infiltration. In the upper and inner angle of the orbit was an elastic, firm, resisting tumor, which could be traced some distance backward beneath the superior orbital margin into the orbit. The tissues along the orbital margin and over the glabella and bridge of the nose were very markedly thickened. The scar of the old injury was plainly visible. On lifting up the lid, the eye was found to be pushed downwards, outwards and forwards, and to be almost completely immovable. Vision was reduced to $\frac{2}{70}$ in this eye and was normal in the other eye. A diagnosis was made of distension of the frontal sinus; and the patient was told that an operation must be done in order to relieve her, to which she at once consented.

On October 31, 1884, the patient was placed under the influence of ether, and a free incision nearly two inches long was made through the upper lid, just beneath the orbital arch and parallel with it. As soon as the knife had cut through the skin and fascia, it entered a deep cavity, and sank out of sight up to the haft. A very large quantity of fetid pus at once poured out and covered everything in the vicinity, and as the wound was enlarged, it continued to well up from the deeper parts, assisted by pressure with the finger in the orbit, and by turning the head of the patient upon the right side, until between two and three ounces of pus had been evacuated, as nearly as could be estimated. After all the pus had been removed, the cavity was washed out with a five per cent. solution of carbolic acid, all of which came out again through the wound, none passing down into the nose. A careful examination was then made with the probe and finger, and it was found that the

right frontal sinus was enormously distended; its floor had been eroded and worn away by pressure at the superior orbital arch, nothing remaining but a very much thinned periosteum. The bony partition between the two frontal sinuses had disappeared in part, so that the probe and the finger could be carried into the sinus of the opposite side. The carious and purulent degeneration had extended into the ethmoid bone, which in the course of years had become an immense abscess, and the plate forming the inner wall of the orbit had been in part worn away, so that nothing separated the pus-cavity in the ethmoid bone from the orbit except the periosteum. All attempts to discover the existence of any connection with the superior nasal meatus, by means of the probe and syringing, failed; but this examination revealed the presence of numerous osteophytes, mainly situated in the cavity of the ethmoid and left frontal sinus. As many of these as could be reached with the finger or forceps were broken off, and then the entire cavity was again carefully washed with a solution of mercuric bichloride, one part to two thousand (1 to 2000). A small rubber drainage-tube, properly fenestrated, was then introduced, the external wound and neighboring parts carefully sponged with the above solution, and covered with several layers of iodoform gauze, and the patient placed on the right side. For the first week the cavity was washed out every three hours, but afterwards this was done only twice a day, and subsequently only once a day. After a few days the drainage-tube was found not to act well, as it became clogged; it was therefore removed and drainage was carried on by a few strands of long fibred lint ravellings. There was a slight rise of temperature on the day after the operation, and considerable swelling of the lids and region of the eyebrow, but hot applications and frequent syringing of the cavity soon removed these symptoms, and from this time the filling of the cavity and the recovery of the patient was uninterrupted.

The patient was discharged on December 16th, 1884, a little more than six weeks after the operation, with the wound entirely healed. The cavity had apparently filled from the bottom, and as it filled, the infiltration in the soft parts

gradually disappeared, so that when the edges of the wound healed, the resulting cicatrix had already retreated somewhat beneath the orbital arch, and the patient began to regain some power over the levator palpebræ muscle. The patient was not seen again until February 2nd, 1885. At this date there was complete restoration of the position and action of the upper lid, and an entire disappearance of the scar beneath the superior orbital margin. All protrusion of the eye had subsided, and the mobility was completely restored, but the eyeball was still on a plane somewhat lower than that of the opposite side. Vision had improved to $\frac{20}{15}$ +, and she had binocular single vision. The fundus of the eye showed nothing abnormal, except a slight discoloration of the temporal half of the right optic disc. The patient complained of a loss of sensation in the course of the supra-orbital nerve, but as this anæsthesia was limited in extent and not very annoying, it was deemed unwise to attempt any operative interference for its improvement.

The pathogenesis of the case is somewhat obscure. The force of the blow was in the direction from below upwards, and the first effect was probably a fracture or dislocation of the nasal bones at their line of union with the frontal bone, or possibly both. The violence of the injury to the bones, complicated by the extensive laceration of the soft parts, probably induced a periostitis, followed by a degenerative osteitis and caries of the nasal process of the frontal bone, which in time opened into the right frontal sinus, and also extended through the thick bony septum in the median line into the frontal sinus of the opposite side. It is possible also that the caries extended along the floor of the right frontal sinus, in a line with the superior orbital margin, and in the course of years ended in complete degeneration and absorption of the bony partition between frontal sinus and edge of the orbit. All this time the process was extending backwards as well as laterally into the cellular spaces and body of the ethmoid bone, and eventually the orbital plate of the ethmoid was perforated and in great part absorbed.

The patient was again seen on June 17th, 1885, and the

recovery was found complete, with perfect restoration of mobility of the lid and eyeball, and a return of the latter to the normal plane.

DISCUSSION.

DR. KNAPP.—I was much struck with the rapidity of recovery in Dr. Bull's case, for it is usually very slow. With regard to treatment, I would suggest that the India-rubber drainage tube be replaced by a perforated silver tube, which I have used in all suitable cases for a number of years. It acts much more nicely, being neither compressed nor twisted. It can be removed, cleansed, disinfected and reinserted with the greatest ease. In some of the cases under consideration, even long after the first operation, carious or necrosed bone has to be taken away before recovery will take place. Many cases do not immediately show their real character, and I am sure that what is called caries of the orbit is in reality abscess in the frontal sinus, which makes its way to the orbital roof, sometimes even in the outer third. In one case, which was particularly important, this was verified by the autopsy, showing abscess in the frontal lobe and an extensive separation of the two tables of the roof of the orbit. An excellent and almost exhaustive paper on abscess in the frontal sinuses, by Dr. Steiner, appeared in Langenbeck's Arch. f. Chirurgie, about ten years ago.

RAPIDLY PROGRESSIVE MYOPIA, PERMANENTLY CHECKED BY DIVISION OF THE EXTERNAL RECTUS.

By GEORGE C. HARLAN.

PHILADELPHIA, PA.

IT is well known that Von Grafe considered insufficiency of the internal recti an important factor in a large proportion of cases of myopia, and recommended section of the external rectus as a valuable therapeutic means. Other well-known authorities adopted his views, and the subject was considerably discussed some fifteen years, or more, ago. Little or nothing is heard of it now, however, and, judging

from the mere passing reference or entire neglect with which it is treated in many recent text-books, it would seem that this operation scarcely holds a recognized position among the methods of treating progressive myopia.

Doubtless the insufficiency of the internal recti that we meet with so constantly in myopia, particularly in the higher grades demanding excessive convergence, is usually a result rather than a cause, and disappears, with the other symptoms, on proper correction with glasses, which establish a normal relation between accommodation and convergence. But is there not a small number of cases in which difficult and painful convergence is an important factor, if not in causing the myopia, at least in promoting its increase? I have been induced to report this case, the subject of which I recently had the opportunity to examine, seven years after the operation, partly because it seemed a typical case of this kind, but chiefly in the hopes of eliciting the experience of members of the Society and obtaining information as to the present position of this operation in practice.

S. P., a strong and well developed boy of 16 years, had carried a pair of $-\frac{1}{2}\frac{1}{4}$ glasses in his pocket for several years, and used them occasionally when sharper distant vision was required. He had no further inconvenience until within the last year he noticed that the glasses did not give such sharp vision as formerly, while for several months there had been a rapid deterioration of his distant sight, accompanied by an increasing asthenopia. Any use of the eyes for near work became difficult and painful, and was followed by lachrymation and conjunctival congestion; finally reading became almost impossible, and he was brought home from school.

Jan. 9th, 1878, the following conditions were recorded. With O. D. $-\frac{1}{15}$ and O. S. $-\frac{1}{8}$ V. $=\frac{15}{40}$, with some letters of 30. With vertical diplopia there was lateral separation of the images, corrected by an abducting prism of 12° for fifteen feet and one of 28° for ten inches. The external rectus overcame 18°, the internal only 6°. There was correct convergence at ten inches, but either eye deviated outwards when covered, and a red glass before one gave a crossed diplopia of 10° for

distance. The prism tests gave substantially the same results with full correction of myopia as without. With correction of M., A. $= \frac{1}{6}$.

Under atropia the myopia was precisely the same as without it, and cylinders gave no improvement. The ophthalmoscope showed retinal congestion with strong venous pulse and a hazy appearance of the fundus, due probably to œdema. There was no conus, but a slight thinning of the choroid in a narrow crescent to the outer and lower side of each disc. Smoked glasses $-\frac{1}{18}$ were ordered, and the eyes were kept under atropia for a month. Afterwards $-\frac{1}{14}$ were given and the atropia discontinued, but complete rest of the eyes still enjoined.

April 30th, there was improvement in distant V. with glasses, but little or no other change. A free section was now made of the external rectus of the left eye, under ether, and a thread placed in position for suturing if necessary. Some hours afterwards it was found that the balance for the position of election was nearly correct, and the thread was removed. Six days after the operation there was, with vertical diplopia, a *homonymous* separation of 2°; and seventeen days after, the images were again crossed, but with a separation of only 2°, instead of 10° as immediately before the operation. The power of adduction was 14°.

As at this time, May 17th, the effect of the operation was insufficient, a course of systematic exercise of the internal recti by means of adducting prisms of gradually increasing strength was carried out; and in the middle of June the power of adduction was 28°, and of abduction 12°.

The patient was now carefully "Dyerized" until September, when he was returned to school and pursued the full course of study without interruption.

In the Christmas holidays vision was found to be with $-\frac{1}{15}$ $\frac{20}{20}$, and some letters of 15. With vertical diplopia there was complete muscular balance. Adduction 38°, abduction 10°. The ophthalmoscope showed a normal fundus except the slight crescent of partial atrophy, which had not changed. The venous pulse had entirely disappeared.

This patient at present has with — 4 D. V. = $\frac{20}{16}$, and A = $\frac{1}{5}$. He prefers to read and work without glasses and has no asthenopia. He has been actively employed for several years as a civil engineer.

The points of interest in this case, in addition to the full test of time, at the most critical period of life, to which it has been subjected, seem to me to be the following.

The insufficiency could not have been the result of the myopia, as it was not affected by full correction.

Accommodative spasm must be excluded as a possible factor, as the degree of myopia was precisely the same after complete atropinization as before.

Continued atropinization and prolonged rest failed to relieve the asthenopia, which was entirely removed by section of the external rectus and exercise of the interni.

Under systematic exercise with prisms, the adducting power was doubled in less than a month. How much it might have increased, as the ultimate result of the operation, without this exercise, is, of course, an open question.

REMARKS ON THE EXTRACTION OF THE CRYSTALLINE LENS IN ITS CAPSULE.

BY D. B. ST. JOHN ROOSA, M.D.,
NEW YORK.

SINCE I published a brief paper upon my method of removing the lens in its capsule,[1] I have been asked by several practitioners, and especially by two distinguished members of this Society, to give a more detailed account of my method of operating. I therefore ask the indulgence of the Society while I bring up a subject some account of which has already been published.

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[1] N. Y. Medical Record, Feb., 1885.

The dislocation of the lens is effected by turning the back of the knife two or three times upon the surface of the iris and the lens, after the counter puncture is made and before the section is finished. The lens is then made to escape by pressure, either with the rubber spoons, or the finger and one spoon. Usually it escapes readily. It is important that the corneal section be large. No iridectomy is performed, and no instrument enters the eye after the section is made. I have now performed this operation more than thirty times, and I am well satisfied with the results. I am by no means sure that it may not remain, like the operation of *Streatfeild*, one chiefly performed by its inventor. A larger experience must decide this, but already no less than four practitioners, three of them pupils of mine, have performed it and are gratified with their experience. I respectfully commend the operation as a safe one. If a failure to dislocate the lens occur, the surgeon may perform an iridectomy, divide the capsule and remove the lens in the usual way. I have not seen opacities of the vitreous in this operation to a greater extent than occurs when the ordinary methods are employed.

DISCUSSION.

DR. DYER.—When the knife is rotated, does it not have a tendency to make a jagged wound?

DR. ROOSA.—I have never seen that difficulty.

DR. DYER.—Is there not an escape of the aqueous humor, and does not the iris get in front of the knife?

DR. ROOSA.—This sometimes happens, but the danger is not greater than in the ordinary operation. I have never lost an eye on account of the operation. Two eyes have been lost. One was from the fact that anæsthesia was incomplete and the whole vitreous came out. The other case happened in a feeble man whose other eye had been lost some years before. Not a drop of vitreous escaped, but the case went on to suppuration and the eye was lost.

DR. WEBSTER.—I have seen Dr. Roosa perform the operation and I have seen the lens move in its fossa. In the case I saw, the aqueous was evacuated and the iris got in front of the knife, but that occurs in other operations. There was very little vitreous lost. I can say of that case as of many

others, it has done well. I have tried two or three times to do this operation without having seen him do it, but I had to stop and perform iridectomy and get the lens out in the old way, because I did not dare to make enough pressure to dislocate it. In one case I extracted the lens without iridectomy by Dr. Roosa's method, except that I did not dislocate it with the back of my knife, and the patient made a good recovery.

DR. NORRIS. Does Dr. Roosa think that he removes the entire capsule every time?

DR. ROOSA.—Not in every instance. The capsule is sometimes torn at one corner, but this is rare. Usually the whole capsule comes away. I do not consider those thoroughly good cases where a portion of the capsule remains. There has never been any capsule left in the pupillary area. What has been left has never formed a point from which neoplastic tissue has grown.

DR. H.W. WILLIAMS.—Might it not be possible that dislocation could be accomplished after completing the incision by external manipulations?

DR. ROOSA.—I have no doubt that it might. I grew into this method of operating by the cases which occur to every one, where the lens was ready to come out and has been removed in its capsule without manipulation. I soon came to find that if I made this manipulation, it was surer and I could count on it.

NOTES OF THREE CASES OF PROGRESSIVE ASTIGMATISM.

BY SAMUEL THEOBALD, M.D.,
BALTIMORE.

IN astigmatism due to corneal asymmetry of traumatic origin, changes in the amount of the optical defect are not infrequently observed. It has been commonly held, however, that in the ordinary form of so-called congenital astigmatism, no such change occurs, but that, however markedly the refraction of the eye may change in other respects, the degree of the astigmatism remains always the same. The following

cases, which doubtless would furnish more conclusive evidence had a mydriatic been used at each examination, show that this rule is, at least, not without exceptions.

CASE I.—Mr. G. P. was eighteen years old when I first examined his eyes, in March, 1872. Atropia was used, and a high grade of hypermetropia, with astigmatism, was discovered.

The following glasses, which corrected the total hypermetropia, as well as the astigmatism, were prescribed.

L. Eye $+\frac{1}{9}$ s. $\bigcirc + \frac{1}{20}$ c. axis 90°,
R. Eye $+\frac{1}{9}$ s. $\bigcirc + \frac{1}{20}$ c. axis 100°.

With these R. E. had V. $= \frac{20}{20}$; L. E., V. $= \frac{20}{70}$, the retina in the left eye probably being defective.

Five years later, in 1877, the patient reported again, saying that his glasses had not of late given him as perfect vision as formerly. With his old glasses V. of R. E. was now only $= \frac{20}{30}$, and the test lines did not appear alike; V. of L. E. was about as before. Atropia was not used, but a careful test showed that a $+\frac{1}{16}$ c. was required for each eye, instead of the $+\frac{1}{20}$ c. previously given. This change brought V. of R. E. to $\frac{20}{20}$ again, and improved, somewhat, that of L. E.

Four years after this, in 1881 (the patient in the mean time having had an attack of syphilitic iritis in his right eye, from which, however, he had made a good recovery), a further increase in the strength of the cylinders, to $+\frac{1}{14}$, was found to be necessary, as well as a change in the L. E. from $+\frac{1}{8}$ s. to $+\frac{1}{7}$ s. These changes brought up the V. of the R. E., which had again declined, to $\frac{20}{30}$, with test lines all distinct, and that of the L. E. to $\frac{20}{50}$(?)

After an interval of three years more, V. of each eye had again declined enough to cause inconvenience, and a further change of the lenses to

L. Eye $+\frac{1}{7}$ s. $\bigcirc + \frac{1}{13}$ c. axis 90°,
R. Eye $+\frac{1}{10}$ s. $\bigcirc + \frac{1}{13}$ c. axis 100°,

was found to be necessary. During the twelve years which intervened between the first and last examinations, the astigmatism in each eye had increased from $\frac{1}{20}$ to $\frac{1}{13}$, a change so

great as to be scarcely explicable, except upon the supposition that there had been an increase of the corneal asymmetry.

CASE II. — Mr. R. D., æt. thirty-four, has depended upon the sight of his myopic and astigmatic right eye for some years, as extensive pathological changes about the yellow spot in his left eye have reduced its vision almost to nothing. In October, 1869, Dr. Russell Murdoch, whose skill in the determination of errors of refraction stands especially high, examined his eyes (without atropia), and prescribed the following glasses:

L. E. plain glass,

R. E. $-\frac{1}{10}$ s. $\smile$ $-\frac{1}{16}$ c. axis 180°.

Nine years afterwards, in 1878, Dr. Samuel L. Frank, after a careful examination, found that the R. E. required $-\frac{1}{7}$ s. $\smile$ $-\frac{1}{12}$ c. ax. 10°; and four years later, in 1882, he changed this for $-\frac{1}{6\frac{1}{2}}$ s. $\smile$ $-\frac{1}{17}$ c. axis 180°.

In August, 1884, these last glasses were still being worn, but with them there was V. $\frac{20}{30}$(?) only, and the test lines were not seen alike. I found that the R. Eye required $-\frac{1}{6}$ s. $\smile$ $-\frac{1}{10}$ c. to $\frac{1}{9}$ c. axis 175°, which improved V. to $\frac{20}{20}$(?); but, as he was satisfied with the sight which his old glasses gave him, no change was made at that time. In May of the present year (1885), however, he reported again, complaining of recent asthenopia. With the same glass which he was wearing at his previous visit, his V. now was only $= \frac{20}{70}$ and one letter of 50. He now preferred $-\frac{1}{5\frac{1}{2}}$ s. $\smile$ $-\frac{1}{8}$ c., which gave him V. $= \frac{20}{25}$(?), and made the test lines equal. Thinking it best, however, to paralyze the accommodation before prescribing a glass for him, I ordered a four-grain solution of duboisia, and repeated the examination after it had been applied three times, the first application having been made the evening before. The result was the same as I had gotten without the duboisia. R. E. with $-\frac{1}{5\frac{1}{2}}$ s. $\smile$ $-\frac{1}{8}$ c. axis 175° V. $= \frac{20}{25}$(?), and lines alike. With $-\frac{1}{9}$ c., however, the result was nearly as good, so that I subsequently prescribed for distant vision $-\frac{1}{6}$ s. $\smile$ $-\frac{1}{9}$ c. axis 175°. With $-\frac{1}{10}$ c. (which I had determined to prescribe in August, 1884) the effect was now so poor that it was no longer to be thought of. Here, then, we have a

record extending over nearly sixteen years, during which time an astigmatism of $\frac{1}{16}$ exactly doubled itself, becoming $\frac{1}{8}$.

CASE III. Dr. E., then 25 years of age, consulted me in June, 1880, on account of imperfect vision. With each eye he could make out only $\frac{20}{50}$ (?), with some letters of $\frac{20}{40}$. A careful examination (without atropia, however) showed simple myopic astigmatism in each eye, and I prescribed for him, to be set in spectacle frames, and worn constantly,

L. E. $-\frac{1}{24}$ c. axis 180°,

R. E. $-\frac{1}{30}$ c. axis 180°,

With these each eye had V. $=\frac{20}{20}$, and saw the test lines alike.

In November, 1884, he reported that for some time his glasses had not been as satisfactory as they formerly were, and complained especially of his near vision. I found that he was wearing his glasses much tilted forward, so as to increase the optical value of the cylinders, and with them in this position he had V. $=\frac{20}{30}$ with each eye. With the lenses placed vertically he had only V. $=\frac{20}{50}$, and without glasses only $\frac{2}{20}\frac{0}{0}$.

It was not convenient to use atropia in his case, but a very satisfactory examination without it resulted in glasses for constant wear being prescribed, as follows:

L. E. $+\frac{1}{36}$ s. $\frown -\frac{1}{12}$ c. axis 180°,

R. E. $+\frac{1}{42}$ s. $\frown -\frac{1}{14}$ c. axis 180°,

which gave again, for each eye, V $=\frac{20}{20}$, but the test lines not quite perfect.

In June of the present year he reported that his new glasses had been very satisfactory, and he desired me to order a duplicate pair for him. I found, however, that with each eye a number stronger cylinder gave a better result, making the lines exactly alike, and the letters more distinct. I therefore prescribed

L. E. $+\frac{1}{42}$ s. $\frown -\frac{1}{11}$ c. axis 180°,

R. E. $+\frac{1}{42}$ s. $\frown -\frac{1}{13}$ c. axis 180°,

which gave for the two eyes V. $=\frac{20}{16}$ (?)

It is to be regretted that in each of these cases all the tests were not made with the eyes under the influence of a

mydriatic, as the results obtained would then, doubtless, be more likely to carry conviction to the minds of those disposed to be sceptical concerning the progression of astigmatism. My experience leads me to believe, however, that had this been done the results would not have been materially different. Such cases are probably not of frequent occurrence[1]; but, if they happen never so rarely, it is of practical importance that this fact should not escape recognition.

If, as seems probable, the increase of astigmatism is due to an alteration in the curvature of the cornea, we should expect to meet with this phenomenon more frequently in the yielding myopic, than in the relatively stable hypermetropic, eye.

TWO CASES OF PENETRATION OF THE EYEBALL BY SCISSORS, DURING THE OPERATION FOR STRABISMUS.—RECOVERY.

BY HASKET DERBY, M.D.
BOSTON.

THE possibility of an accidental penetration of the eyeball, by the scissors, during the operation for strabismus, is apt to strike us as remote. It is certainly seldom alluded to in treatises on ophthalmology. In twenty-five more or less complete works on the eye, besides a large number of monographs on strabismus, I find but two allusions to such an occurrence.

Prof. Alfred Graefe says (Graefe-Saemisch, vol. 6, p. 168), "If the division of the tendon of the muscle results in a perforation of the sclera, we need feel no hesitation in attributing this to a want of dexterity. Such an accident must be due either to want of skill or to the careless use of pointed scissors. The wound always heals by first intention."

[1] I have the notes of several other cases less striking than these I have related, and Dr. Russell Murdoch tells me, among other cases, of one in which he observed an astigmatism change during nine years from 1–48 to 1–24.

Wecker (Chirurgie Oculaire, p. 264) briefly speaks of the possibility of incising the sclerotic, and says it can be repaired with a suture of catgut.

It has been my fortune to attend two cases in which this accident took place, and to carefully watch the recovery from the injury thus inflicted. The anxiety felt by the operator in each of these, owing to the proximity of the wound to the ciliary region; the necessity of keeping from the knowledge of the patient and his friends the nature of what had occurred, and the extreme slowness of the healing process, all contributed to invest the matter with a peculiar interest, as well as to prove that recovery was by no means as simple or as sure as had been represented. No such cases have, to my knowledge, ever yet been published; and I therefore feel the less hesitation in presenting these.

CASE I.—I was called to see a man, aged twenty-six, on whom an operation for strabismus convergens had been attempted, two hours before. The surgeon, a man of large experience, though not a strict specialist, reported that he had inadvertently used a pair of sharp pointed scissors, supposing that they were his ordinary strabismus scissors, and not otherwise examining them. Meeting with some difficulty in finding the muscle, and something at the time occurring to divert his attention, he employed a little extra pressure and suddenly felt his scissors penetrate the eyeball. No attempt had yet been made to divide the muscle. The wound made was found to be about six millimetres in length, and a portion of the vitreous, equal in size to a cherry stone, was said to have protruded. Two sutures had been taken in the conjunctiva over the wound. When I saw the patient he had not sufficiently recovered from the effect of the ether to enable me to test his vision. The pupil was quite large, the wound entirely hidden by the conjunctiva that had been drawn over it. I applied atropine, and ordered liquid diet and perfect rest. A compressive bandage was also applied.

The next day the bandage was found to be stained through by a bloody serous secretion. During that and the following night there were severe paroxysms of pain, occurring at in-

tervals and relieved by removing the bandage and applying iced compresses. On the third day these pains ceased and the compressive bandage could again be used. There was now great photophobia and much ciliary redness. The pupil continued clear. On the fourth day I etherized the patient and removed the sutures. A small amount of vitreous still projected between the lips of the wound. The redness was less, the cornea and pupil clear. Two days later the wound had contracted at least one-half and the vitreous disappeared. On the eleventh day the wound opened a little and a small amount of vitreous projected. This was thought to be due to his efforts in chewing, meat having been allowed the past two days. It was now withdrawn. On the nineteenth day the wound had apparently wholly closed and the patient was allowed, for the first time, to leave his bed. Just before rising, however, he was attacked by very severe pain in the eye, so intense that the bandage had to be immediately loosened. This pain was accompanied by redness and contraction of the pupil; the whole subsiding in twenty-four hours. Eleven days later another paroxysm came on, and was so severe that a subcutaneous injection of morphia had to be made for its relief. The pupil became much contracted as on the previous occasion. This was the last troublesome symptom, and the patient was discharged on the forty-first day, the wound being thoroughly closed and vision equal to about seven-tenths.

This case is instructive as showing that the accident is by no means as simple or as devoid of danger as might have been supposed. Convalescence lasted nearly six weeks, the wound healed very slowly, showing a tendency to open and allow the escape of more vitreous as late as the eleventh day, while inflammatory attacks lasted up to the thirtieth. I may say, in concluding, that several years have since elapsed, and the patient at last accounts was doing perfectly well.

Case II.—A lad of eighteen had a convergent strabismus of eight millimetres in the left eye. This dated, according to the parents, from a severe attack of convulsions at the age of eight. The hypermetropia amounted to 1.5 D. Vision was

however very imperfect, being 0.4 in the right eye, less than 0.1 in the left, and could not be improved by any glass or combination of glasses. The left internus was divided in the usual manner.

A year later a convergence of three millimetres still existed. An operation was now proposed in the right or best eye. The patient having been etherized, the usual incision was made in the conjunctiva close to the corneal edge, and the points of the scissors carried well back towards the caruncle, dissecting as they went. I should here state that the operator subsequently discovered that, intending to select from among his instruments a new and sharp pair of scissors, he had in reality taken a pair that had been condemned on account of dulness and set aside to be sharpened. The muscle was next raised on the hook without difficulty, and its division attempted. Unusual resistance seemed to be met with, the tissue seeming tougher than usual; this led to a greater tension being exerted by the hook in the left hand, as well as the employment of more force with the scissors in the right, when there suddenly appeared an opening in the globe, some four millimetres in length, through which the choroidal pigment and the vitreous were plainly visible, though the latter did not protrude. The operation was instantly suspended and a compressive bandage applied. The patient was required to remain in bed.

No subsequent pain was experienced. Three days later the bandage was removed and the eye examined. The edges of the wound had approximated, but were not wholly in contact. The pupil was of natural size, but there was marked greenish discoloration of the iris. Lachrymation was excessive, and the patient complained of blurred sight. On the sixth day the discoloration still persisted, vision was 0.2, and a magnifying glass showed the edges of the wound to be held apart by the interposition of a minute bead of vitreous. The compressive bandage was continued another week, and the patient closely confined. On the eleventh day the iris had resumed its normal color. By the fifteenth the wound had entirely healed, although blur was still complained of. On the twenty-first day all traces of the accident had disappeared,

and vision was almost 0.4, being nearly as good as before the operation. Since then the patient has resumed his former occupation (that of a printer), and finds his eyes as good as ever.

It is easy to see why cases like the foregoing should seldom find their way into print. No man likes to expose himself to criticism by recording his own mistakes. Unusual as accidents of this nature may be, they are certainly possible, and their ultimate result deserves to be recorded.

DISCUSSION.

Dr. Webster.—I remember that Dr. T. R. Pooley published a case of the kind. I think with a wood-cut.

Dr. Knapp.—I am not quite sure about that case of Dr. Pooley's. It was not proven that there was perforation of the sclerotic. If I am not mistaken, Dr. Pooley in publishing the case stated that he had no suspicion of any injury being done to the sclerotic.

I know positively that I have pierced the sclerotic in three cases during squint operations, and I take this opportunity of communicating the facts, reserving a fuller publication of the cases. I have made about three thousand squint operations, and these three are the only cases in which I am confident that the accident occurred. In the first two it happened because the assistant gave me a pair of newly sharpened scissors, which instead of having the ordinary blunt points were as sharp as daggers. I was aware of the accident during the cutting, and my suspicion was confirmed by some sinking back of the iris, escape of vitreous, and reduction of eyeball tension. I finished the operation and applied conjunctival sutures. I told the patients that the cutting had been deeper than usual and that it would be safer for them to remain in the hospital. These two patients were kept in the hospital for about twelve days. The recovery was undisturbed and the result good in both. When a clean scleral wound is nicely adjusted and the patient remains quiet for a week, there is almost without exception union by the first intention.

The third case was done with the ordinary blunt-pointed scissors in my office, in a gentleman who had convergent strabismus from syphilitic paralysis of an external rectus. I made the operation in the ordinary way, but, probably by folding of the sclera by too great a traction with the hook, I cut a triangular opening in the sclerotic. The operation

was completed when I noticed the accident. I united the wound carefully and sent the patient to the hospital, where he was kept like a patient after an extraction of cataract. The recovery was smooth. The interior of the eye was perfectly clear and the sight was as good as before.

In those three cases, I *know* that I pierced the sclerotic; whether I have done so in other cases, I do not know. All the other cases healed without any disturbance, with the exception of one, in which suppuration of the wound occurred. It was about twelve years ago that I operated on the son of a wealthy man who lives thirteen miles from New York. It was in January. The operation, done under ether, passed smoothly; the boy was taken home in a carriage, and on the way leaned out of the window to vomit, and vomited for some hours. I was called to see him two or three days later. There was some obscuration of the cornea. The region of the wound was swollen, the conjunctiva puffy, and there was dense purulent deposit in the wound. I cleansed the eye carefully, and ordered cold applications. The wound healed very nicely, but left a considerable strabismus divergens. I saw the boy a short time ago. There were a few blue places in which the choroid was shining through as in ciliary staphyloma. They were not the result of perforation, for I examined for perforation and found the tension of the eye normal. There is now no trace of corneal opacity, and I advised the patient to have the divergent strabismus corrected by an advancement.

I have lost one eye after a strabismus operation. It was a child on whom I operated at the dispensary, and three days later scarlet fever broke out. It was at the time of an epidemic of diphtheria in the city. The wound became diphtheritic and the eye was lost. This was not my fault. The operation was quite regular, and at the same time I operated on two other children successfully. No one can know when a child is in the incubation stage of scarlet fever.

DR. MITTENDORF.—Some time ago I was invited by a general surgeon to be present at a strabismus operation. He perforated the sclera. As he had the muscle on the hook at the time, I advised him to divide it. The wound healed in four or five days. In the book that I was writing at that time, I emphasized very strongly the point that the operation should not be attempted with sharp-pointed scissors. If the muscle is not divided its tractions are apt to keep the wound open and prevent union by first intention. If the muscle is divided this is not the case, and I think that the wound will heal more rapidly.

Dr. E. Williams.—We have all heard that an open confession is good. Some time ago I perforated the sclerotic. It was a case of convergent strabismus in an amblyopic eye. When I got the hook under it, it suddenly came to a stop. I dragged on it and introduced the scissors. The eyeball was pretty tight, and in severing the tendon I cut the sclerotic. The patient was told that it was necessary to go to bed and have the eye bandaged. The eye got well without the least trouble, and there was nothing in the ophthalmoscopic appearances to indicate the point of perforation. That was the only case in which I have perforated the sclerotic in strabismus. I am in the habit of publishing my accidents for the benefit of the profession, and I think that I published this case some eight or nine years ago.

Dr. Risley.—I would ask if these perforations were meridianal or equatorial. I think that it is important to ask this question in considering whether the muscle should be divided or not after the perforation of the sclera. If the puncture were equatorial and posterior to the attachment of the muscle, we should say on theoretical grounds that the muscle should not be divided, since the normal action of the undivided muscle would tend to keep the lips of the wound in coaptation and thus favor its union. If the puncture is meridianal, I do not see why the tenotomy should not be completed. If on the other hand the wound is anterior to the attachment of the muscle and equatorial in its direction, the tendon should be divided, since the contraction of the undivided muscle would cause the wound to gape.

Dr. Derby.—In both of the cases I described, the puncture was in front of the muscle.

Dr. E. Williams.—In my case, the opening was close to the tendon.

Dr. Webster.—Dr. Pooley stated that in his case there was choroidal atrophy at the seat of operation.

Dr. Buller.—This subject is an important one to all of us. The most skilful operator is liable to accidents of this kind, and it is well, I think, to have brought the matter forward in this Society for discussion. I myself should like to speak of two cases of which I am cognizant, and of which I had the treatment afterwards. In both instances I saw the operation performed. It was for convergent strabismus. A large gaping wound was made in the sclerotic at the attachment of the tendon, some four or five millimetres in length. These cases occurred within a few months of each other. The operation was the sub-conjunctival operation.

When it was finished, I had a good view of the wound in the sclerotic, through which vitreous protruded. In both instances the conjunctiva was stitched and a bandage applied. In about a week the patients went out perfectly well. There was some little discoloration of the iris. The operation was completed at the time of the accident, and the squint was in both cases cured. The result was fortunate, and differs from that reported by Dr. Derby. I do not suppose, however, that there was any special merit in the mode of after treatment. I wish simply to put these cases on record, as having occurred in the hands of two well known and skilful operators.

DR. FOX.—I also was present at an operation where the same accident happened. Panophthalmitis developed and the eye was removed.

DR. KNAPP.—I recall another case, not of my own, which I have seen. The eye did well. Even in the sub-conjunctival operation, which I always practise, the accident can be avoided by turning the concavity of the scissors upwards.

DR. E. WILLIAMS.—I always try to follow rigidly the advice of Professor Arlt, to divide the tendon close to its insertion in the sclerotic.

ON THE ACTUAL CAUTERY IN DESTRUCTIVE CORNEAL PROCESSES.

BY H. KNAPP, M.D.,
NEW YORK.

SINCE Martinache of San Francisco[1] introduced the actual cautery into eye surgery, a number of publications have appeared, all of which recommend its use. They are quoted in an admirable paper by Nieden, in the last number of the Archives of Ophthalmology (vol. xiv. p. 31). Nieden gives a concise, yet full description of all the phases of this new mode of treatment, or rather of this new revival of an old one. He bases his remarks on one hundred and forty cases of various forms of corneal processes, traumatic keratitis, hypopyon keratitis, strumous infiltration, serpent ulcer, and xerosis corneæ. His results were :—no loss, 3% of adherent leucoma, 9%

[1] Ulcers of the Cornea treated by the Actual Cautery. *Pacific Medical & Surgical Journal*, 1873, p. 294.

of leucoma, 88% of macula corneæ. Since the introduction of local anæsthesia by cocaine, the use of the actual cautery has received a new impetus, and as it is now freed from its chief unpleasant concomitant, pain, it seems destined to become a general method of treatment. Among the authors that have made communications on the use of the actual cautery under cocaine I mention Nieden in Hirschberg's Centralb., Nov. or Dec., 1884; Schweigger in Berl. Klin. Wochenschr., Jan., 1885; Grüning in the same number of Arch. of Ophthal., March, 1885, in which the translation of the above mentioned paper of Nieden is contained. All speak encouragingly of this kind of treatment.

I have employed it since May 11th of this year in nineteen cases. I will cite several of them.

A case of *strumous keratitis* had lasted twelve weeks. When the patient came under my treatment, April 24th, there were many marginal phlyctenulæ and a *scrofulous band* which extended from the lower-outer part of the cornea almost to the centre, terminating with a marked gray infiltration. As a collyrium of corrosive sublimate and the usual treatment did not improve the conditions in three weeks, I destroyed the infiltrations at the crest of the band with the actual cautery. No pain followed. The improvement was immediate and the affection soon cured. In a case of *corneal pustule*, almost central, the yellowish-gray exudation was destroyed with the actual cautery May 22d. Three days later the eye was found in the same condition, though the patient felt better. It required two more cauterizations to obtain a regular border and clear floor of the ulcer. Then it assumed the character of a facet and the patient was discharged cured in twenty-nine days.

Another case was that of an anæmic boy who for several summers had suffered from circumcorneal hypertrophic conjunctivitis with roughness of the eyelids. He came to me June 23d, with *hypopyon-keratitis*. A deep ulcer was above the centre of the cornea, its floor covered with a yellow exudation, its periphery ragged, with stripes of infiltration extending into the neighboring corneal substance. There was

hypopyon of three mm. in height. The eye was very painful, shrunk from the light, and watered profusely. The pupil was narrow, the iris dull. Circumcorneal injection pronounced, but no chemosis. I burned at once the whole extent of the ulcer. The next day the pupil was widely dilated by atropine, the hypopyon had disappeared, the ulcer had clear edges with gray offshoots, but its floor was still covered with a yellowish-gray deposit. I cauterized it again, but more mildly. Improvement. A third cauterization three days later. From that time recovery rapid. Facet, almost filled up.

Another case was that of a lady with very serious *hypopyon-keratitis*. There was a central corneal abscess with yellowish white lines down the cornea, and an hypopyon of 4–5 mm. in height. Intense pain. The first cauterization produced some improvement. After the second, two lateral points of yellow infiltration—small abscesses—had made their appearance; the central abscess was larger, with irregular borders, and the level of the hypopyon was higher, covering about one-third of the vertical diameter of the cornea. It looked as if the cornea was going to be destroyed. I cauterized the infiltrated parts of the cornea in their whole extent. The next day marked improvement in all the symptoms. Two days later improvement continued. But little hypopyon. Ulcers contracting. Some white places at borders of ulcers cauterized. The recovery was now steady, leaving a macula.

I shall omit several ordinary cases of *pustular keratitis* that quickly recovered after one or two cauterizations, yet I beg leave to say a word on a corneal pustule, occurring in the very nervous wife of a physician. For several weeks I treated it locally with atropia, corrosive sublimate and yellow ointment, while her husband attended to the constitutional treatment. We made no headway in four weeks; the pustule developed into a deep ulcer with unclean floor and infiltrated edges. I begged her strongly to let me burn the ulcer under cocaine, but she would not consent, at least not this time. A week later she came again, the eye free from irritation, the infiltrated ulcer converted into a clean facet. What a pity that she did not allow me to cauterize the pustule!

There were four cases of serpent ulcer without hypopyon, but with a good deal of iritic irritation.

The first was in a man who had had a chancre of the penis three months previously, and still had a large irregular sore, with partially hardened floor, on the inner side of the upper lip. I had treated him three weeks with collyria of bicarbonate of soda and corrosive sublimate (1:12,000), and with atropia instillations. He had great photophobia and excessive pain, which was allayed by cocaine. The ulcer progressed steadily and there was marked congestion of the iris. The infiltration was superficial, but extended over a large crooked line, showing a number of larger round gray patches. I cauterized first three of these patches at the upper end of the line. He had considerable pain afterward. Two days later I cauterized the middle of the line. No pain followed, and the burned part of the ulcer became cleaner. In two more sittings I burned the remainder of the infiltrations. Patient had lost his pain, lachrymation and photophobia, the gray infiltration of the ulcer disappeared, the pupil became wide, the circumcorneal injection vanished, the ulcer covered itself with epithelium and healed, leaving a superficial opacity which, when the patient was seen June 20th, occupied the outer upper third of the cornea, not interfering much with the sight. July 10th, he reappeared with two round patches of infiltration near the cornea. I burned them lightly.

The second case was treated in the Dispensary. The ulcer occupied the lower third of the cornea, was deep and its floor very dull. It was extensively cauterized. The improvement was marked. It required five applications in the course of three weeks, and one two weeks later, when some well-marked patches of gray infiltrations made their appearance in the otherwise smooth, rather extensive macula.

The third case was that of a man from Louisville, who had a recurrent cicatricial keratitis of three months standing, showing a deep strongly infiltrated central ulcer with gray irregular borders. From June 25th to July 7th, I cauterized the ulcer and its border three times, and scraped it out once with a sharp spoon. July 7th, the ulcer had strongly contracted, and

was clearing up. Thinking that the further recovery would go on undisturbed, I advised him to return to his home.

The fourth case was that of a gentleman from Youngstown, O., who came to me first March 18th, 1885, with what appeared to be a crescentic ulcer, at the inner periphery of the cornea. I treated it with atropia, corrosive sublimate (1:10,000), and compressive bandage. It spread over the upper part, but was tolerably clean, and was filling up in the course of two weeks. The patient went home, but the ulcer became worse. He had great pain, especially at night, and returned to New York June 12th. The ulcer had spread over the whole upper and nasal parts of the periphery of the cornea, had a deep, rather clear floor, but gray infiltrated edges toward the centre of the cornea and at both ends. I cauterized the infiltrated edges three times the first week, once the second. The ulcer cleansed itself and was filling up. Patient early in July went to the seaside at Sea Girt, N. J. Three days after his arrival there he had great pain in his eye, lachrymation and photophobia. When he returned to New York, July 7th, I found the inner lower edge of the ulcer infiltrated and extending further down. I cauterized this place and let the patient return to Sea Girt. He felt better, and when he came to see me again, July 10th, I found the ulcer and its edge much clearer. I cauterized a few points superficially.

A very sad case was that of a working man of 30 years, who came to me June 11th. He had had severe inflammation of his eyes when he was 11 years old, which had permanently weakened his sight, yet he could see so much with his right eye as to be employed as a basket-maker. I found old corneal maculæ in the left, and in the right an old small prolapse of iris to which the iris was drawn, leaving a small slit-shaped pupil. For three days this eye had pained him, watered and discharged somewhat. I found moderate circumcorneal injection, the prolapse of iris swollen and yellow (purulent infiltration). The cornea, iris and pupil were clear. Knowing how dangerous purulent infiltrations of iris prolapses are, I cauterized the projecting part. The patient had no pain, but had to have this eye open on his way home, as the other

eye was blind from detachment of the retina. He was, however, accompanied by his mother and had not far to go, from 24th street to 4th. When he reached home, about half an hour after the cauterization, his eye began to pain him and continued painful until 3 o'clock at night. The next day I found the eye free from pain, more injected, the protrusion flatter, a superficial corneal ulcer below the infiltration, the iris greenish, the pupil dull, and vision reduced to seeing movements of the hand. I saw that purulent iritis had set in. In a few days, though the corneal ulcer disappeared, the progress of the suppuration in the interior was manifest. The globe perforated in the upper ciliary region, pus escaped, and a blind phthisical globe is the result.

How far is this disaster attributable to the remedy? I think but very little, if at all.

Dr. Duyse, in a recent paper on purulent inflammation of iris-prolapses produced by traumatism, ulceration, or operation, especially cataract extraction, states that all eyes so affected are lost. This is certainly true for most cases, but there is an exception every now and then. I cured such a case by prompt action. A small iris-prolapse from an extraction of cataract inflamed in the most violent and acute manner a year later by a prolonged exposure of the patient to rain. He called me in the evening at 9 o'clock. When I had examined his eye I at once went home, took an assistant with me and excised the prolapse cleanly and deeply. The suppurative inflammation was at once arrested and the eye saved. The case is described in one of my reports on cataract extractions. The danger of driving a suppurative inflammation of conjunctiva and cornea into the interior of the eye by interfering with a prolapsed iris is certainly real. Having seen panophthalmitis follow the abscission of a prolapse of iris in a few cases of purulent ophthalmia, I have for years not touched protruding iris as long as there is purulent discharge. In such cases we may imagine that the infectious substance, after the removal of the iris, finds a freer avenue to enter into the globe, but in the case under consideration the object I had in view was to destroy the infected, call it septic,

exudation. This was done superficially, no wound was made, no part destroyed or injured. The suppuration had, however, already made so much headway that even the actual cautery was not sufficient to arrest it. This is my opinion of the case.

In two cases of beginning suppuration of the cornea after extraction of cataract, I cauterized the edges of the wound with the glowing point according to Abadie. In one case the suppuration did not extend and the whole cornea remained clear, in the other panophthalmitis developed. It did not appear to me that the actual cautery had any effect on either of those eyes.

If, in conclusion, you will allow me to review my experience, I may state that the actual cautery, now so handy after the introduction of cocainization, finds its safest and most beneficial application in the various forms of pustular keratitis, further in serpent ulcers and in corneal abscesses with hypopyon. In serpent ulcer it will, for the near future, certainly be *the* remedy, and a greater acquaintance with the mode of its application and the extent of its action bids fair to furnish us with a therapeutic agent that will control this hitherto unmanageable affection. I have used in all my cases a platinum probe heated with a spirit lamp, but Nieden calls this obsolete and clumsy. He recommends Pacquelin's thermo-cautery, or the galvano-cautery, giving preference to the latter. An apparatus devised for this purpose by Sattler, consisting of a strong Grenet's element with wires and two keys, modified by Nieden, is made by Mr. Albrecht, in Tubingen, for mk. 25. I have caused Meyrowitz Bros. of New York, to import it, for from the communications in literature, which are supported by my own still limited experience, I do not doubt that the actual cautery will, in the near future, be most extensively tried, and may become a very valuable therapeutic agent in ophthalmic surgery.

DISCUSSION.

DR. HOWE.—In regard to the instrument, I procured one of these instruments last winter, but in using it, I fused the points. I have heated an ordinary needle in the flame of a

spirit lamp and have found it to answer very well. I recall three cases in which I have used it, and in these the corneal ulcer has lessened somewhat. Some stress is laid on the point that the entire edge of the ulcer should be cauterized. The parts which are cauterized take on a healthy action, while those which are not, do not.

Dr. E. Williams.—I am much interested in this use of the actual cautery. I have believed in it for many years. It has been a uniform practice with me for the past twelve or fifteen years, particularly in phlyctenular ulceration of the cornea in scrofulous children, to cauterize with carbolic acid. This has acted admirably. The half necrotic tissue, which has too much life to die, and too little to live, is what we want to get rid of. We take a wooden tooth-pick and dip it into the carbolic acid. Sometimes we scrape the bottom of the ulcer, where it has persisted for a long time, and then apply the pure carbolic acid. If there is a band across the cornea, we scrape it all off. The next day the child is better. We continue the same treatment as before. This is the uniform treatment for these cases of phlyctenular keratitis. Sometimes, where perforation is imminent, we make a paracentesis, either before or afterwards, generally afterwards. Sometimes we make the paracentesis through the bottom of the ulcer, sometimes through the transparent part of the cornea. I am perfectly sure that the observations of Dr. Knapp have a foundation in truth, and that this measure will be a valuable means of treating destructive processes in the cornea. I remember that Desmarres objects to the use of nitrate of silver points in corneal ulcer, that if you take a cornea already thin, and cauterize the ulcer with nitrate of silver, you probably go through the cornea, and make a larger destruction than is necessary. While I am sure that this is too severe in many cases, yet I am sure that even this often arrests the destructive process, especially in strumous, phlyctenular inflammation.

Dr. Wadsworth.—For several years, I have occasionally used, not as a rule, and not for phlyctenular keratitis, but for ulcus corneæ serpens, and for sluggish, painful infiltration of the cornea, the pure carbolic acid. In the cases of sluggish infiltration, the application is generally preceded by scraping, as Dr. Williams has done, using the gouge that is used for foreign bodies. Once or twice, I have found that simply scraping the tissues away, without the application of carbolic acid, was sufficient, and this has been the case where the infiltration had resisted treatment for a considerable period. I have applied the carbolic acid with a pointed stick.

DR. NORRIS.—How does Dr. Knapp know when he has done enough? What sign is there to show complete cauterization?

DR. KNAPP.—I go over the infiltrated surfaces carefully. Whether or not I have done enough, the next day will show. In extensive serpent ulcer, I have never ventured to touch the whole surface.

DR. WADSWORTH.—When ulcus corneæ serpens has been extensive and severe, I do not remember that carbolic acid has ever entirely stopped the process. Within six months, I have used the acid in two such cases. Although the infiltration was at first checked, it yet went on again, until finally I operated, dividing the cornea. In lighter cases it is effective. A man, seventy years of age, who had lost one eye by corneal ulceration ten years ago, came to me recently with beginning ulcus corneæ serpens of the remaining eye, and with blennorrhœa of the lachrymal sac. The ulceration was effectually stopped by two or three applications of the acid.

CONGENITAL PARESIS OF BOTH EXTERNAL RECTI MUSCLES.

BY GEORGE C. HARLAN, M.D.,
PHILADELPHIA, PA.

I WISH to briefly report this case, rather as a matter of curiosity than as having any practical interest. The patient consulted me for another trouble, not having any apparent connection with this defect. She had always had double vision in the outer part of the field on either side, and abduction was evidently deficient in both eyes. The diplopia commenced at about 45° from the median line. There was no asthenopia.

Her mother, who accompanied her, had the same defect, in more complete form, in one eye only. The left eye could not be abducted beyond the median line, but there was no strabismus, except when vision was directed to the left.

As there was no other paralysis in either of these cases, there is nothing to throw any light on their pathology. At the meeting of the Society in '81, I reported a case of complete congenital paralysis of both abducent nerves, accompanied by complete paralysis of both facials, proving a central lesion.

LIPOMATOUS PTOSIS.

BY H. S. SCHELL, M.D.,

PHILADELPHIA, PA.

UNDER this title I desire to make a note of a form of ptosis resulting from an unusual accumulation of fat in the cellular tissue of the upper eyelid. I have had in all four cases illustrating this condition. They all occurred in young women of from eighteen to twenty-five years of age. The patients were well nourished, without being fat, and the deformity was in all cases symmetrical. The ptosis was, of course, produced by the weight of the lids, and in each instance covered at least the upper half of the cornea, even under the greatest exertion of the levator. In one instance the upper two-thirds of the cornea was concealed.

The only subject of complaint, however, was the deformity. The fat, drooping lids gave a disagreeable expression, at the same time somewhat sinister and sensual, to the face.

The eyes were in all cases large, prominent and emmetropic, and the palpebral fissure long. The diagnosis could easily be made in consequence of the doughy sensation communicated to the finger and thumb when the tissue was gently pinched and palpated.

In operating, I simply made a horizontal incision through the skin, the entire length of the closed lid, midway between its free margin and the edge of the orbit. The fat was found lying between the skin and the orbicularis muscle, and was dissected out and the wound closed, without the removal of any integument. The smallest amount of fat removed from any one lid weighed thirty-five grains; the largest, seventy-one grains.

The levator recovered its power, and the ptosis disappeared in a period varying from one to four weeks.

In one case the deposit returned in the upper lids of both eyes, and in the secondary operation I pulled out from behind the upper edge of each orbit, and cut off, a considerable mass of fat. This operation was done two years ago, and there has been no further return of the deformity. The eyes are fairly well opened, and the expression natural.

DISCUSSION.

DR. NORRIS.—I have seen such cases. I have the photograph of one, a quadroon, otherwise good-looking, who was disfigured by these drooping lids. I removed a considerable amount of the fatty tissue. The result was favorable, and the appearance of the patient much improved; but the lipoma was evidently accompanied by some faulty development of the levator, or impairment of its innervation, for there was never the full play of the upper lid observed in normal eyes.

DOUBLE OPTIC NEURITIS AND OPHTHALMOPLEGIA FROM LEAD POISONING; COMPLICATED BY TYPHOID FEVER.

BY O. F. WADSWORTH, M.D.,
BOSTON.

IN patients suffering from lead poisoning optic neuritis is not very uncommon, although usually in such case associated with nephritis. That lead may cause combined paralysis of the extra-ocular muscles together with neuritis, as in the case I have to report, has not to my knowledge hitherto been observed. In the present instance there was not only no nephritis, but aside from the ocular symptoms none which could with probability be referred to lead, at least which could not as well or better be attributed to the inter-current typhoid fever.

A well-grown boy of nine years passed the summer of 1884 in the country. In August, twice, at an interval of a week, after riding an easy-gaited horse three or four miles, he complained of headache. Very shortly afterward, at the end of

August, he came down with what the physician in attendance called slow fever. He was perhaps a week in bed, complaining of headache, then somewhat better, up and dressed, and with fair appetite. During this time, it was observed that his left eye did not move as well as the other, and about the beginning of his sickness, and occasionally afterward, the left pupil was said to have been somewhat the larger.

As he continued ailing, he was brought to Boston, September 25th, and placed under the care of Dr. O. W. Doe, to whom I am indebted for the use of his notes.

After reaching Boston the boy appeared generally rather dull, would sometimes lie quiet for a long time with his face in the pillow, but on one or two days was quite bright and lively. He had a fair appetite; pulse and temperature were not far from normal; there was no headache; the spleen was decidedly enlarged; there was no other typhoid symptom. The urine contained neither albumen nor casts. Once or twice, while driving in an easy carriage over a smooth road, he complained that the road was rough. The left eye turned neither to the right nor left, but could move upward and downward. Electricity was applied to the recti muscles.

On October 6th, shortly after eating a good breakfast, he had sudden vomiting, with little or no nausea. On the same day Dr. Doe first observed that the left pupil was a little larger than the right.

I saw him first on October 8th. He was up and dressed, in very good flesh. There was no movement of the left eye inward or outward, somewhat diminished movement downward, good movement upward. The movement of the right eye was decidedly diminished outward, good in other directions. The left pupil was larger than the right; both reacted to light, the right better. Vision R. diminished, L. much diminished. (It may be said here that the determination of the vision was at no time, either now or subsequently, so exact as could have been wished, because of the desire of the boy's mother that nothing should be done to discourage his feeling that his sight was better than it really was.) The media were clear. In both eyes the discs were much swollen, with steep

sides, opaque, vascular, the inflammatory appearances confined within an area of not more than two diameters. There were no hemorrhages, the retina was everywhere quite clear and transparent, and its vessels not apparently altered in calibre or course.

While many of the symptoms appeared to point to obscure typhoid, I regarded the neuritis and peculiar ocular paralyses as most readily explained on the supposition of a tumor in the region of the pons, and gave that as the probable diagnosis.

Potass. Iod. gr. x. 3 t. d., ordered.

Dr. C. F. Folsom saw the patient on the following day, and because of the slight evidences of pressure (headache, vomiting, etc.), and the fact that he had observed anomalous nervous symptoms from lead poisoning, suggested the possibility that that might be the cause of the ocular symptoms here.

On the 10th the boy took a short drive, complained on his return of weakness, and had dizziness and nausea on moving his head or rising. For the next week or ten days he was confined to bed or sofa, his pulse and temperature high (102.4 was the highest temperature reached), his dejections yellow and typhoidal in character; in short, there were fairly marked typhoidal symptoms. He vomited once or twice only after taking his medicine.

On the 11th the spleen reached an inch below the ribs, and there was also increased hepatic dulness noticed for the first time. For two or three days the spleen and liver continued to enlarge, but by the 17th had begun to diminish again. On the 21st the spleen had become of normal size, while the liver still reached two thirds of an inch below the ribs. A few days later the liver also had returned to normal dimensions.

Meantime I had seen him twice. On the 14th vision seemed less in each eye than on the 8th; with the right, the better eye, he read letters about = 30 or 40 at 1′. The field seemed of normal extent in both. Left pupil the larger, both reacted. The swelling of discs a little increased, with many fine vessels. The retina bright and clear everywhere. Movements of left as before, perhaps slightly impaired upward also; movement of right diminished outward, a little diminished inward and perhaps downward.

On the 20th the left pupil reacted little by itself, the right well. The right, better, eye could not count fingers at 16″. The fundus as before. Lateral movement of left none, movement upward and downward somewhat defective. Movements of right as on 14th.

Before this date, October 20th, an examination of urine passed four days after beginning to take the Iodide had been made by Dr. E. S. Wood and no lead found. A second examination, before November 1st, gave a trace of lead and decided the diagnosis.

November 1st, the temperature was still above normal, the pulse ranging from 100 to 110. The boy was cheerful, and improving in general condition. Both pupils were large and equal when I saw him; both reacted promptly to light in the right, or to attempts at accommodation, although never very small. The left eye barely saw movements of the hand; the right counted fingers imperfectly at 1′, and with fixation much above. Field of right apparently normal in extent. Swelling and vascularity of discs a little less, the rest of fundus clear as before. Movements of left much as on October 20th; of right, inward and outward a little less than before, upward and downward good. He was now taking Potass. Iod. gr. xv., and the dose was increased to gr. xx.

From this time his general condition steadily improved; by November 7th he began to drive out.

Of a specimen of urine sent on November 10th, Dr. Wood wrote, "there was a larger amount of lead than in the previous specimen, I should designate it as considerable."

I did not see the boy again till December 30th. His general health had become very good. His vision had sunk since my last visit, but was thought by his mother and himself to have improved somewhat of late. The movements of the eyes had become quite normal, and the irides reacted well, although the pupils were rather large.

There was a little divergence of the left eye, and slight drooping of upper lids of both. It was doubtful if he could count fingers, even at a few inches. The right eye was the better, and the best vision was obtained with fixation above

and to the right. Swelling of discs nearly gone, their surface pale, and showing but few fine vessels, the arteries small, veins nearly normal in size.

He was last seen by me May 9th. He could not count fingers. The outlines of the discs were more defined, and their surface more uniform and opaque. His health was very good. There was then still a trace of lead in the urine, but by the last of May it could no longer be found.

DISCUSSION.

DR. ROOSA.—I would ask if the way that the lead entered the system was discovered?

DR. WADSWORTH.—It was found on inquiry that the drinking water was taken from a cistern in which was a piece of lead pipe several feet long.

PNEUMOPHTHALMOS, OR AIR IN THE VITREOUS HUMOR.

BY W. F. MITTENDORF, M.D.,
NEW YORK.

THE entrance of air into the interior of the eye may take place during an operation, such for instance as a cataract extraction. The air will get into the anterior chamber not unfrequently before the lens is delivered, or this may occur at times after the removal of the lens. In the first place it can be easily removed by pressure upon the cornea; but after the delivery of the lens it requires more care to get rid of a little air bubble that may have got into the eye.

It is, however, entirely different when air gets into the vitreous chamber. Fortunately this is such a rare occurrence that so far no description of it has been given. It has been the good fortune of the writer to see two cases of this kind within the last two years. Both occurred as complications of injuries caused by the entrance of a foreign body into the interior of the eyeball.

Such accidents are as a rule so serious that any complication of them becomes a matter of importance to the attending physician. The presence of iron, wood, stones, shot and similar objects in the interior of the eye has been frequently diagnosed by means of the ophthalmoscope, but the presence and especially the subsequent diagnosis of air in the vitreous chamber is so rare, that the cases I am going to report today will I hope prove of interest.

On November 3, 1883, a young man of 20, Chas. K. German, blacksmith by profession, presented himself at the New York Eye and Ear Infirmary, with the history that a few hours before, while working at his trade, his left eye was struck by a small piece of iron. On the nasal side, and more in the posterior region of the ciliary body, a pretty large irregular wound with prolapse of the vitreous humor was seen. The lens appeared clear and not injured, the iris was not affected, and the anterior chamber free from blood. The vision of this eye was fingers at ten feet, that of the right one was $= \frac{2}{2}\frac{0}{3}$. No reflex from fundus. Being busy with other patients, a flannel bandage was applied to the eye after some atropine had been instilled, and the patient was told to wait a short time.

About two hours after the first examination the bandage was removed from the eye, and the patient informed me at once that he could see much better. This improvement of vision was easily explained after an ophthalmoscopic examination. The vitreous was almost perfectly clear except at the lower portion of the posterior chamber, where a dark mass was seen which consisted evidently of the foreign body surrounded by coagulated blood. This mass appeared to be connected with the wound in the sclera. The most remarkable appearance, however, was that of three round bodies in the upper portion of the vitreous chamber. One of these was larger than the other two, being about half the size of a pea; the smaller ones were apparently of the size of a rape seed. I say apparently, because they were seen through lens and cornea, and consequently appeared larger on that account. The larger one of these globules was a little higher than the posterior pole of the lens, and evidently not far behind it; of

the smaller ones, one was a little above and behind the larger one, and the other was near the dôme of the vitreous chamber, if I may use this expression.

The most striking feature of these bodies was their highly refractive power and the black margin surrounding them. They presented exactly the same appearance that we see so often under the microscope, and from this fact, I as well as Dr. Walker, who saw the case with me, concluded that this must be air in the vitreous humor. Having never seen anything of this kind before, I requested Dr. E. G. Loring to look at the patient. He confessed that this was an entirely new thing to him, but suggested that it might be oil that had been attached to the foreign body and had been carried with it into the eye. The patient, however, informed us that he had not used oil that morning, and that there could not have been any on the iron that struck him. On moving the eye these bodies moved only a little.

An attempt was now made to remove the foreign body by carefully inserting a permanent magnet through the wound in the direction of the clot, but it was not successful. The patient was therefore bandaged and put to bed. Anxious to know what would become of the air-bubbles, he was directed to lie quietly on his back. The next morning the bandage was cut away from the patient's head in order not to disturb the eye. Lifting the man carefully to an upright position, I found upon using the ophthalmoscope that there was only one large globule and this was just at the posterior pole of the lens, adapting itself apparently to the shape of the lens. After a little while the globule commenced to rise slowly to the upper part of the eye, and in doing so it became elongated, the pointed end being downwards; it presented exactly the appearance of an oil globule rising in water. After reaching the upper part of the vitreous chamber it became less distinct, and about forty-eight hours after the accident no trace of it could be found. Suffice it to say, that the eye suffered for some time from a mild form of cyclo-choroiditis, but that the patient left the hospital after a few weeks with a moderate amount of vision, and that he has suffered very little ever since in spite of the presence of the foreign body in the eye.

Case II.—The second case is that of a young stone-mason, who was injured either by a piece of stone or iron on the morning he came to me. The wound was irregular, not very large, and its location was in the outer and lower part of the sclera. The vitreous was only partly clear, but in the upper portion of it a round, highly refractive body, exactly of the same appearance as those of Case I., could be seen. The patient was bandaged, and told to go to the Infirmary to have the attempt made to remove the foreign body by means of the magnet. Unfortunately the patient never appeared again, and I do not know what became of him.

Unable to find anything in literature in regard to the appearance of air-bubbles in the vitreous humor, I concluded to make some experiments in order to determine the possibility of the entrance of air into the vitreous chamber, to study its appearance after it got there, to determine the time of its absorption, and to differentiate air from oil if this was possible. For this purpose I took four rabbits, and by means of the hypodermic syringe, which I filled with air or oil alternately, forced the air or the oil into the vitrous chamber. The first two rabbits were subjected to the air experiment. After carefully cleaning the syringe so that even under the microscope no oil could be seen in the water that had been in the syringe, I filled it with air and pushed the point of the instrument into the vitreous through the posterior portion of the sclera. This was done in order to avoid the formation of a traumatic cataract, which would have interfered with the ophthalmoscopic examinations that were to follow.

In trying to force the air into the vitreous I encountered, however, great difficulty. The air would escape along the point of the syringe, on account of the intraocular tension, and none would remain. However, withdrawing the syringe slowly, after it had entered at least as far as the centre of the vitreous humor, and forcing the air from the syringe at the same time, I succeeded in three instances in having one or two distinct air-bubbles remain in the vitreous. They presented exactly the same round appearance, the peculiar refractive brilliancy and the dark contour, but, on account of the wound

in the vitreous, caused by the entrance of the point of the syringe and which remained distinctly visible as long, or even longer than the air, which became gradually absorbed, the appearance was not quite so pretty as that on the injured eye described before. The air became completely absorbed within forty-eight hours.

Into four eyes a small quantity of olive oil was injected. The oil globules resembled the air-bubble very much, but they were all slightly colored, the centre of them appeared even more brilliant, and the contour was darker and heavier. They did not disappear so readily as the air did; they were distinctly visible for nearly a week after the experiment was made. In one of the cases a traumatic cataract followed; the other eyes remained perfectly healthy for several weeks, in fact as long as the animals were under observation.

1. The entrance of air into the vitreous body of the eye can only occur after part of the contents of the vitreous chamber has escaped.

2. It is favored by the entrance of a foreign body, which causes a large, irregular and gaping wound in the sclera.

3. In order to allow air to enter the vitreous humor, this must either be very fluid, or its anatomical arrangement must have been disturbed by the entrance of the foreign body, or the air must have been attached to the foreign body and been thus carried with it into the eye.

4. The air in the vitreous appears like an air-bubble as seen under the microscope; it is more or less round, highly refractive in the centre, and with a sharply defined black contour.

5. Oil globules in the vitreous humor present a similar appearance to air-bubbles; but they appear heavier, they are not perfectly colorless, and their outlines are darker; they are also more glistening in the centre.

6. Air-bubbles will be completely absorbed within two or three days; their presence is not a source of great danger to the eye. Oil globules last longer, but their presence is likewise not irritating.

DISCUSSION.

DR. KNAPP.—I saw such a case in London a number of years ago. The appearance was very striking, and any one who has seen an air bubble under the microscope can make the diagnosis. The air bubble was seen not far from the macula lutea. The case, if my memory serves me, is reported in the London Ophthalmic Hospital Reports.

I have seen a second case in New York, but this may have been one of Dr. Mittendorf's cases.

DR. BULLER.—I can corroborate what Dr. Knapp says of the London case. There was quite a large bubble, which decreased very much in size within twenty-four hours. The case has been reported in one of the late numbers of the Ophthalmic Hospital Reports. We did not find a foreign body in that case. There was some extravasation of blood near the air bubble, but a foreign body could not be discovered, although no doubt one was present.

DR. DENNETT.—The refraction of oil is nearly that of glass. The refraction of olive oil is 1.4 and that of glass 1.5. Was it more difficult to find the presence of the oil globule than the presence of the air globule?

DR. MITTENDORF.—On the contrary, the oil globule was the more distinct. I think that the oil is more highly refractive than the air. The oil globule under the microscope presents a darker outline than the air bubble. There was also always some slight color to the oil. I used the best olive oil, but there was always quite a little display of color.

A CASE OF TUBERCULOSIS OF THE IRIS.

BY MYLES STANDISH, M.D.,
BOSTON.

E. A., a girl fourteen years of age, was first seen by me on the 22d of May, 1885, when I obtained the following family history. Her father was a man of good health, and had never acquired syphilis, but had used alcohol to excess. Her mother was a healthy, well-nourished woman, and had borne four children, of whom our patient was the eldest. All the children are living, but are somewhat pale and delicate looking and rather small for their ages. The mother had never had any mis-

carriages. Neither the mother nor our patient, nor either of her brothers or her sister, ever had any eruption upon the body, any continued sore throat, swollen glands, or any purulent discharge from the ears.

Our patient is small in stature, pale and anæmic, and although her menses have been established for a year, has a peculiarly slight and girlish form. There is nothing in the configuration of the shape of the head or teeth to indicate inherited specific disease. She had always been considered well until the summer of 1884, when she had an attack described as nervous prostration. She attended school however in the autumn for two months, when in the last week of November she was taken ill with the following symptoms: Pain about the waist, with much distress for breath and an inability to lie down. Ascites soon developed, with severe epigastric pain, nausea and vomiting; there was no jaundice, no evidence of disease of the kidneys, no evidence of any lesion of the lungs, no general tenderness of the abdomen, and no diarrhœa. The diagnosis of her family physician was acute hepatitis. All of the above history was confirmed by this gentleman, who is a skilful physician and accurate observer.

The patient recovered slowly, but in three months time had recovered her color and accustomed weight, her menses had returned and she was considered quite well.

Four weeks before I first saw her, our patient began to complain of feeling tired and a general feeling of malaise, and about the same time her right eye began to trouble her, with no history of an injury; it became red and the sight gradually became dim, but as she did not complain of much pain the mother supposed it, as she said, to be a cold in the eye, and neglected to apply for advice. Upon discovering, however, that the eye was quite blind she immediately brought her for treatment.

Upon examination, the condition of the eye was found as follows: The conjunctiva somewhat hyperæmic in certain areas near the sclero-corneal margin; the cornea somewhat hazy, with several deposits on the membrane of Descemet; the iris firmly attached throughout its entire pupillary margin

to the capsule of the lens. The pupil blocked by lymph. The iris was not congested, but in general had a somewhat atrophic appearance.

Above the pupil and springing from the iris near its ciliary border was a rounded protuberant growth two millimetres in diameter and projecting from the plane of the iris to an estimated height of one millimetre. This growth, was broader at the top than at its base, and of a yellowish color slightly tinged with pink. Over the surface of the tumor coursed several small vessels. No view could be had of the fundus. An attempt was made to dilate the pupil by the repeated use of a one per cent. solution of atropine during several days; this failing, cocaine and duboisia were used separately and together, all with no effect. V. O. D. $= \frac{6}{200}$.

The case was watched for four weeks, in which time the growth slowly increased to double its size when first seen. A one per cent. solution of atropine was used during this period. This growth of the tumor was unaccompanied by pain, and the conjunctiva became white, presenting only a few enlarged vessels. Vision became reduced to the perception of shadows.

Dr. Wadsworth then saw the case with me in consultation. At this time the eye had not been examined by me for a week, and three new growths, a millimetre in diameter or less, were found springing from the iris at other points near the ciliary margin of the iris. These new growths were not accompanied by any access of pain or congestion of the iris, and by only very slight injection of conjunctiva. Dr. Wadsworth agreeing with me in my diagnosis of tubercle, enucleation was advised. I enucleated the eye on the 20th of June, at the Massachusetts General Hospital.

The patient made a rapid recovery, and now appears in much better condition as to general health.

Upon examination of the eye microscopically after removal, the vitreous body was found to be normal, the retina and choroid in apposition to the sclera and normal in appearance, the ciliary body of normal size and not involved in the pathological change, the lens substance somewhat opaque. The iris was attached to the capsule of the lens very firmly

throughout the entire circuit of its pupillary margin, and also beneath the entire area of the base of the principal growth. This growth sprang from the iris near its ciliary margin. The base of the growth was two and five-tenths millimetres in diameter, and rose from the plane of the iris two millimetres, when, coming in contact with the cornea, it was spread out, conforming to the curve of the inner surface of the cornea, to a width of four millimetres. It was non-pigmented.

The growth was given to Dr. Harold C. Ernst for examination, and he makes the following report:

The Warren Anatomical Museum. New growth submitted for analysis July 9th, 1885.

A tumor two or three millimetres in diameter lying anterior to the iris and connected with it. The specimen had been previously hardened in Müller's fluid, thus rendering it impossible to speak of its fresh appearances. Having been washed for thirty-six hours in distilled water, the specimen was re-hardened in absolute alcohol, sections made and placed under the microscope. Thus the growth was seen to come from the iris, this side of it being well supplied with vessels. Farther out from the point of attachment the tissue was made up of granulation, with a number of giant cells. No cheesy degeneration was present. Sections stained after Koch's modification of Ehrlich's method showed the presence of a few bacilli of tuberculosis. The first treatment of the specimen rendered the detection of these organisms more than usually difficult.

Diagnosis, Tuberculosis of the iris.

DISCUSSION.

DR. KNAPP.—Every now and then I see apparently similar growths, that disappear under mercurial treatment, in persons with no history of syphilis. It would seem that the presence of the tubercle bacillus makes the diagnosis certain. In the living I have never ventured to make the diagnosis. I do not know whether they are gummata, simple granulation tumors, or tubercles.

DR. STANDISH.—In the cases referred to was the iris quiet? In this case there was no congestion of the iris during the progress of the growth. There were synechiæ when I first saw it. The iris and conjunctiva remained quiet.

DR. KNAPP.—Iritis, or rather irido-choroiditis, was present in all the cases as far as I remember.

DR. WADSWORTH.—At the time that I saw the case, the smaller growths were scattered about and not at the periphery. They had appeared within a few days. They were grayer and not so yellow as the growths which I have been accustomed to look upon as gummata. In regard to the question of recovery, I believe it is a fact that the cases which have been reported, when they have been followed for any length of time, have almost invariably died. It was so in the case I reported a year or two ago, in which the child presented no symptoms at the time nor for some time afterwards, but finally died from an acute attack which resembled tubercular meningitis. The present case is too recent to allow us to say that the disease may not yet be fatal.

DR. KNAPP.—They are not like the ordinary gummata, and I know that they disappear.

DR. MITTENDORF.—The only way to determine the true nature of these growths is by inoculation.

DR. CALLAN.—At the New York Eye and Ear Infirmary I saw a case in some respects similar to the one described. This occurred in a man twenty-five years of age. Gumma usually appear at the pupillary margin, but this was at the periphery. It disappeared under specific treatment.

DR. WEBSTER.—I would ask the reader of the paper if the finding of the bacillus tuberculosis renders the diagnosis of tubercle positive? and whether this is never found anywhere but in tubercle?

DR. STANDISH.—The bacilli which were found were typical tubercle bacilli. Other microscopic signs of tubercle were present. Giant cells were found. Dr. Ernst said that there was not the slightest doubt of it being a case of tubercle.

DR. SEELY.—I would ask Dr. Knapp if he makes the differential diagnosis of gumma from the location?

DR. KNAPP.—Not exclusively.

DR. SEELY.—From my personal experience I would not say that that was a point in the differential diagnosis. They frequently are not on the pupillary margin. Certainly they occur between the margin and the periphery, and even near the periphery. The length of time which the disease had existed would have a bearing on the point.

DR. CALLAN.—As a rule they occur on the pupillary margin. The case I referred to was at the periphery.

DR. KNAPP.—I agree with what Dr. Callan says. These growths are found near the pupil nine times to once at the periphery. I have paid particular attention to their location for years.

DR. SEELY.—I have seen a good many cases of gummata of the iris, but I would be far from saying that there was any such rule. I think that it is not the case. A good many gummata occur near or at the periphery, certainly in the substance of the iris between the pupillary margin and the periphery. I have seen far more further along in the iris than at the pupillary margin. While I am aware of the rule, I cannot see why it should be a rule. I know no reason to determine their formation at the pupillary margin any more than at the periphery.

A SECOND CASE OF SEROUS EFFUSION INTO THE VITREOUS HUMOR, PROBABLY DUE TO MALARIA.

BY W. W. SEELY, M.D.,

CINCINNATI, O.

AT the 18th Annual Meeting of the Society, I reported a case of "Serous Effusion into the Vitreous Humor, probably of Malarial Origin."

A reference to the history of that case will show that it was a striking freak of the malarial poison.

Any one who lives in a region, not perhaps so much of "chills and fever," as one giving rise to "chronic malaria," sees any number of peculiar manifestations of the malarial poison.

The case already alluded to was the first I had seen of vitreous affection, and, so far as I am aware, the only one reported. I am confident, however, that it is a condition of things that will be found more frequently, now that attention has been directed to it.

It is in fact not at all improbable that this effusion has already been seen but interpreted "hæmorrhage," as I stated in my remarks three years ago. I am not aware, however, of any case of total filling of the vitreous with blood—and that too with no adequate cause—totally abolishing the vision, the vision returning again somewhat, these variations continuing for a year or more, and then, within a period of three to six weeks, becoming $\frac{20}{20}$ with no visible floating bodies remaining.

In Jan., 1885, Mr. W. came to see me about an eye trouble. I found that his left eye deviated outwards to a slight extent. Patient stated that it began to deviate a year ago last April. About the same time a something like an immense floating body or veil came in or before the R. E., so reducing the vision that he could not recognize persons opposite to him in the street car.

Some six or eight weeks before consulting me he had a second attack in the R. E., but he was able to recognize people perhaps half a square on the street.

On testing the vision I found it to be *nil* in the L. E. The vision of the R. E. equalled $\frac{20}{20}$, with no manifest ametropia, and the vitreous totally free from floating bodies.

The L. E. presented a clear lens and no movement in the vitreous, a sort of indefinite grayish appearance permitting no red reflex, in a word, the same appearance as was presented by the case previously reported.

The sensation made by the examination of such a case is so out of the ordinary, that I can hardly see how any one could fail to be impressed by it.

This patient had had supra-orbital neuralgia on the left side every spring and fall, from his 16th to his 23d year. He is now 27.

Once or twice a year of late he has had a "bilious attack." Since seeing the patient he has had no repetition of the dimness of vision in the right eye; the left, according to his physician's report, remaining totally blind.

QUININE AMAUROSIS. REPORT OF TWO CASES.

BY E. WILLIAMS, M.D.,
CINCINNATI, O.

THE first cases reported are those of A. Von Græfe, published in Vol. III. of his Archives in 1857. Notwithstanding he could detect no ophthalmoscopic changes, the temporary blindness in both eyes was followed by permanent impairment of sight in one eye. Recently Dr. E. Gruening has given a resumé of the literature on this subject, in Knapp's Archives, Vol. X. He endeavors to establish the pathognomonic symptoms of this toxic trouble. He says, "On reviewing the unequivocal cases of quinine poisoning with amaurosis, we find a remarkable congruence in their essential features. The patient, after the ingestion of a single dose, or of repeated doses of quinine in varying quantities, suddenly becomes totally blind and deaf. While the deafness disappears within twenty-four hours, the blindness remains permanent as regards peripheric vision, central vision gradually returning to the normal after some days, weeks, or months. The ophthalmoscope reveals an ischæmia of the retinal arteries and veins without any inflammatory changes. In view of the constancy of these symptoms and the uniformity of the ophthalmoscopic picture, we are entitled to demand for this distinct type of amaurosis a recognized position in the pathology of the optic nerve and the retina."

In the same volume from which this quotation is taken, there are reports from other competent observers of similar cases, to which I now add briefly the following two.

Dr. J. G. H., aged forty-two, of southern Kentucky, suffered a violent attack, eight years ago, of what was called congestion of the stomach. It lasted about a week, and was attended by severe pains, cramping attacks, and frequent vomiting and

retching. With the impression that the trouble was malarious, he took quinine in heroic doses. It was administered hypodermically, per rectum, and on the raw surface of a large blister, endeavoring to retain twenty grains every two hours. During the attack he thinks he took an ounce of quinine. In four days he became suddenly and totally blind and deaf, not being able to discern light, and hearing absolutely no sound. The only thing heard was the tinnitus. The deafness continued thirty-six hours, and the total blindness four days. In six weeks he was well and could see, as he now says, as well as ever. The hearing has never been completely regained. His field of vision is concentrically contracted in both eyes. The color sense seems to be now perfect. The optic discs are very white, all the capillaries having disappeared, and the calibre of the main arteries and veins being very much reduced in size. After the ophthalmoscopic examination, I was greatly surprised to find his central vision perfect in both eyes.

The other case was a nephew of the doctor, fourteen years old. He was attacked about the same time, with similarly severe symptoms, lasting about as long as with the uncle. The boy was treated likewise heroically, and in the same ways, but the amount he took is not definitely known. He got suddenly blind and deaf, about four days after the severe attack of, so called, congestion of the stomach. His color sense was very defective, and even with the best seeing eye he made serious mistakes. The atrophy of his optic discs is extreme. V. = 0.3 in right eye, and with the left he can only count fingers at eight inches, centrally. There is evidently great contraction of his field of vision. He has a nystagmus, the movements being upwards and downwards, and he experiences very great difficulty in accommodating himself to sudden and great changes of illumination. These cases consulted me on the last day of the past month, and the day before I left home. Of course, in the hurry, I could not give them a more detailed and careful examination. But the pathognomonic symptoms are present. In the youth, there is permanent and very great impairment of sight.

DISCUSSION.

DR. ROOSA.—I think if Von Græfe's cases of amblyopia from the use of quinine are read over in the light of our present knowledge, we shall all have grave doubts whether or not they belong to the category of cases so recently reported in this country. Von Græfe's cases were treated by him as though they were cases of congestion, and they recovered under that treatment. If I am correct in my recollection, there is no note made of this peculiarity of telescopic vision, or of marked diminution in the calibre of the large vessels and disappearance of some of the capillaries. If these cases were submitted to analysis, I think they would be found to hardly belong to this category.

As regards the ophthalmoscopic appearances, I think that it will be remembered by the Society that in very few instances, with the exception possibly of Dr. Buller's case, was the ophthalmoscopic examination immediate on the blindness. I am inclined to think, judging from my own case, long since reported, in which a man took four hundred and eighty grains in twenty-four hours, I am inclined to think, from the results of my examination made three days after the blindness appeared, that the primary ophthalmoscopic condition is not ischæmia, but excessive congestion, and that view, although I am unable to produce any solid proof, is sustained by the analogous condition in the ear. In my experiments made fourteen years ago, I found invariably where any effect was produced (in one or two no effect was produced), overloading of the bloodvessels of the drum head, of the auricle and of the canal, and great tinnitus. There was also overloading of the vessels of the conjunctiva. In one case, I thought that I discovered congestion of the vessels of the optic papilla. In these experiments, I gave large doses to healthy people.

We need observations on this one point, as to the condition of the bloodvessels of the papilla immediately after the toxic effects are discovered. That the ischæmia occurs within a short period, there can be no doubt. All observations agree in that respect. The patient whose case was reported in the Archives of Otology lived some seven years afterwards, and to the last retained $\frac{20}{30}$ in the telescopic field.

DR. BULLER.—I am inclined to agree with Dr. Roosa in regard to the primary congestion. The case I have reported did not show at first an extraordinary degree of diminution of the bloodvessels. At first indeed, the retinal bloodvessels did not appear to be at all diminished, but in a few days there

was great diminution, and in the course of a week the vessels became extremely small, and have remained so ever since. This patient, whom I still see occasionally, has retained a narrow field, without any impairment of central vision. Six months ago she came to me imagining that there was some further loss of sight, but such proved to be not the case. The first ophthalmoscopic examination, if I remember rightly, was made the day following the occurrence of the blindness.

AN OPERATION WITH A DOUBLE NEEDLE, OR BIDENT, FOR THE REMOVAL OF A CRYSTALLINE LENS DISLOCATED INTO THE VITREOUS CHAMBER.

By C. R. AGNEW, M.D.,
NEW YORK.

To remove a dislocated lens from the anterior chamber of the eye is difficult, and to remove one from the vitreous chamber and save the integrity of the organ is perilous, and more difficult than any other operation in ophthalmic surgery. Excellent authorities therefore agree in recommending, in many cases, the practice of enucleation rather than to incur the immediate and later risks of attempted removal of dislocated crystalline lenses.

In numerous cases of dislocated lens the aqueous and vitreous humors are altered in their physical condition, being commingled or degenerated. When that is so, the instant that an opening is made for introducing a scoop, or other instrument, to extract the misplaced and mobile lens, there is a quick loss of the fluid contents of the eye. The eye-wall falls in, the cornea crumples, and the lens, eluding the instrument used for its removal, sinks into the vitreous chamber. If detachment of the retina or choroid with hæmorrhage does not immediately occur, great violence is done by the operator in prodding after the lens. If the lens be finally extracted, secondary consequences occur, which cause the wounded eye

to be very irritable and prone to become the focus of sympathetic trouble for the fellow eye. To avoid so direful a sequel, cautious operators have preferred to enucleate the eyeball in which there is a misplaced lens, instead of attempting to extract. This conclusion, reached by so many, has no doubt been furthered by the difficulties attending the fixation and subsequent extraction of the dislocated lens with the least loss of the fluid contents of the eye, and with the least traumatism.

Having had many cases of dislocated lens in the thirty years of my public and private work, I had come to look upon them as very embarrassing. I had also had occasion to know from actual trial, and with a fair amount of dexterity, the difficulties attending all the proposed methods for the removal of the offending body. Considering the alternative of enucleation, I could not help remembering that, easy as the mechanical part of that precedure is for the merest tyro in ophthalmic surgery, it is not without grave drawbacks for its subjects. A quiet, sightless eyeball, unless so enlarged as to be monstrous and a conspicuous deformity, is far better than the best fitting artificial eye. Furthermore, the history of the sockets left by entire enucleation is not, by any means, one of unbroken satisfaction. Enucleation is always a serious mutilation, and, like an amputation, should never be done if any other less radical procedure is practicable and prudent. I cautiously dissent from the doctrine, that, inasmuch as danger to a fellow eye may possibly occur at a more or less remote epoch in cases supposed to resemble those in which sympathetic trouble has been known to happen, therefore we should always enucleate in a case in which sympathetic disease *may* possibly result. A considerable, and probably an increasing, number of cases in which sympathetic disease is not present, may be safely treated upon the expectant plan, or by surgical procedures in which less than the entire eyeball is sacrificed.

Believing that the impossibility of removing dislocated lenses, in some cases, without inflicting upon the eye destructive violence, had induced surgeons to resort to enucleation,

it occurred to me to attempt so to modify the existing methods as to lessen what seemed to me to be the greatest difficulty, namely, to secure fixation of the lens in an accessible place, till a corneal wound had been made sufficient for its removal; and, in addition, to use the lens by means of the instrument of fixation, so as to plug the pupil more or less closely and retard the efflux of the fluids of the eye to as late a moment as possible in the manœuvre. If this is attempted by the use of a single needle, it may not be possible to raise the lens, if if be submerged in the vitreous humor. If it be raised, it may not be possible to prevent its falling over the needle and becoming again submerged, thus provoking the operator to dip his instrument again and again in the depths of the eye, to the injury of the tissues through which it penetrates or is swept. If the single needle is so used as to lift the lens and hold it near enough to the anterior chamber to be easily accessible after corneal section, its handle must be intrusted to an assistant, and thus it happens that two operators are acting in some of the steps of the operation without the indispensable benefit of accurate and unfailing coöperation. It is much better in those surgical manœuvres in which the quality of the result must depend greatly upon the harmony of consecutive steps that one will should be in control. This rule holds, however skilful and accordant the assistant may be.

Influenced, then, by the two foregoing considerations, among others, I devised the double needle, or bident, which is shown in the illustrations which accompany the narrative of the following case.

I. M., aged twenty-seven, has been blind in his right eye from earliest infancy. The form and general appearance of the exterior of the organ are normal. Its iris is tremulous, the pupil contractile, and somewhat more dilated than that of the fellow eye. Its crystalline lens is of full size, or nearly so, opaque and mottled, as from beginning calcific degeneration. The lens is also so loose that it moves to and fro with a quick, volatile motion, though suspended, on the temporal side, by a narrow, hinge-like attachment of the suspensory ligament. When the patient throws his head back the lens is snatched

out of the direct view of the observer, but may be seen by oblique inspection in the temporo-ciliary region. The eye is sometimes irritable, but seldom, if ever, reddened, and there is constantly present a sense of something in motion in the eye.

The patient is painfully conscious of the startling deformity which the perpetual appearance and disappearance of the white lens in a dark pupil produces on every motion of the eye and head. For some time the fellow eye has also engaged his attention, partly because its endurance seemed to be lessened, and partly because apprehension has arisen lest sympathetic disease might make an insidious invasion. Although for many years intolerant of the idea of any operative interference, he has at last become convinced that he cannot much longer endure the irksomeness of his condition, and the dangers which threaten the faulty organ. The vision of his well eye is $\frac{20}{15}$, that of the fellow eye = 0.

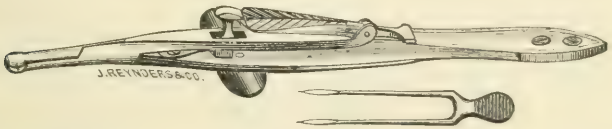
Several surgeons had examined the case, and more recently, at my suggestion, he sought the advice of a most eminent colleague in New York. The latter advised that the troublesome eye should be enucleated, instead of any attempt being made to remove the dislocated lens. In this the patient would not acquiesce. He therefore went to his home, in a distant city, but almost immediately returned again to New York, as the eye seemed to be worse, and sympathy in its fellow more noticeable.

After explaining that my attempts to remove the lens might fail, and that it might be expedient, during the course of such an operation, to resort to immediate enucleation, the patient left the matter entirely in my hands.

Believing that the ordinary methods for the removal of a lens dislocated into the vitreous humor would fail, I devised the procedure which is now offered for consideration. I dilated the pupil with atropia, but could not produce as wide dilatation as might have been expected in a normal eye. I then placed the patient on his back in charge of the following medical colleagues: Drs. Webster, Coleman, Beard and Ring, requesting them to keep his head as immovable as possible, to avoid

the complete detachment of the lens. We then gave ether as thoroughly as possible. Observing that the eye retained some sensibility even after the breathing of the patient had become stertorous, and wishing to have analgesia of the organ, we instilled a few drops of four per cent. solution of hydrochlorate of cocaine upon the conjunctival surface. I next opened the eyelids with a Gräfe's speculum, and fixed the eye by grasping the tissues between the insertion of the inferior rectus and the margin of the cornea with ordinary fixation forceps. Looking in through the pupil we could just discern the dislocated lens lying far to the temporal side of the vitreous chamber in the ciliary region. I now brought into use the little appliance with which we hoped to facilitate the removal of the lens. The instrument, with its handle, a Sands needle-holder, is delineated in the first illustration.

Fig. 1.



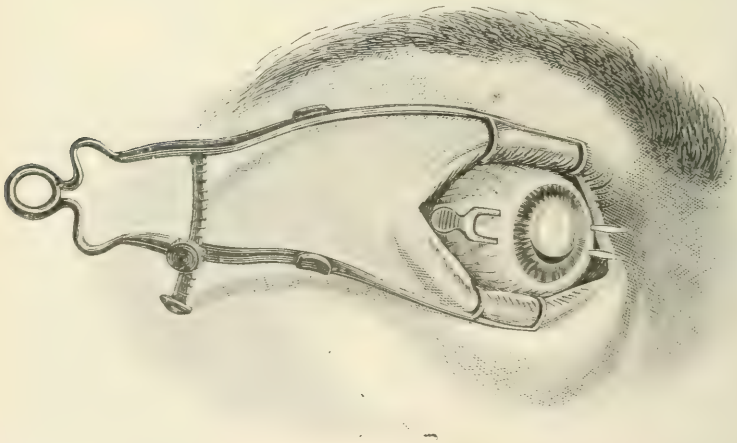
It consists of two ordinary, fine, straight, delicately pointed, cataract needles, about six-eighths of an inch long, fixed parallel at a distance a little less than an eighth of an inch apart. These needles are united at their proximal ends by a projection which is flat, and otherwise so shaped and roughened as to be adapted to the grasp of the beak of a holder, such as that known in the shops as Sands's needle-holder. Although averse to laying any claim whatever as an inventor of new instruments, I may, perhaps, venture to call the needles a bident.

Having mounted the bident in the holder with the thumb catch of the latter uppermost, and having the eyeball firmly fixed as previously stated, I penetrated the temporal aspect of the eyeball at a point just far enough back to enter the vitreous chamber without wounding the iris, or touching the dislocated lens, till the bident had penetrated the vitreous humor to a point a little to the temporal side of its centre. I then, by depressing the handle of the holder, caused the points

of the bident to describe an arc forwards. I was greatly pleased to see the lens caught on the bident—as a pea might be lifted on a two-tine fork, and brought forward through the pupil into the anterior chamber. I then pushed the bident on and caused its points to emerge on the nasal side of the eyeball close behind, but avoiding the iris.

The neat completion of the wound of exit was insured by placing the end of the forefinger of my left hand upon the surface of the eyeball at the point to which I was directing the bident. In this manner the scleral conjunctiva being pressed upon the points of the bident, they were passed so quickly through the subconjunctival space after penetrating the sclerotic as not to let any fluid flow into and distend the subconjunctival connective tissue. The holder was then detached from the bident, and the lens remained free upon its prongs and pressed against the cornea, as shown in the second illustration.

FIG. 2.



With a narrow Gräfe's knife I then made a sufficient wound in a downward direction in the cornea, and easily completed the delivery of the lens with a delicate wire or skeleton spoon. Under similar circumstances I might probably deliver the lens by withdrawing the points of the bident from the opposite

eye-wall and passing the lens through the corneal wound by the necessary lateral movement of the instrument, and dispense with the use of the spoon.

I then removed the bident with the holder. Although this was done without difficulty, I would prefer, under similar circumstances, to do it with my thumb and forefinger, as being quite easy, and thus avoiding the necessity of applying the holder a second time. Not applying the holder would cut off one movement from the manœuvre. There was scarcely any appreciable escape of fluid, as the lens seemed to plug the pupil, and on its delivery the bident was instantly removed. The corneal wound fell into neat coaptation, and there was no prolapse of iris.

I then closed both eyes, greased the surface of the eyelids with white vaseline, applied light compresses of absorbent cotton, a thin flannel bandage, and over all a black silk mask. The patient was placed in bed on his back, and much motion and all forms of excitement forbidden.

For two days the dressings were not removed. At the end of that time they were removed, the entire surface of the eyelids washed with warm solution of hydrarg. bichloride, one to two thousand, and some of the same solution allowed to penetrate the palpebral slit. As the eye was somewhat painful and reddened, a drop or two of a two per cent. solution of sulphate of atropia and of a four per cent. solution of hydrochlorate of cocaine was also instilled, and the dressings reapplied. Such was the course pursued.

The recovery was continuous and uneventful. The operation was done November 13, 1884, and the cure was complete December 1, 1884. The pupil remained responsive to light. It had become a little drawn in the direction of the corneal wound, though contractile and not adherent.

As the eye had been quite blind from infancy, no vision was expected after the operation. Subsequent ophthalmoscopic examination revealed extensive plaques of old choroidal and retinal atrophy, with complete atrophy of the optic nerve, lesions antecedent to or soon following birth.

January, 1885.—Patient has been again under observation

for an affection of the ear. The eye is well, and the result in every way satisfactory to the patient, to my friend, Dr. Webster, and to myself.

It may be said that the lens might have been removed by using a large spoon through a section of the cornea with or without iridectomy. That with other methods was considered and dismissed as impracticable. I had had the case under observation for more than seven years, and studied it in the light of every known surgical procedure. I do not think I could have met the indications with any of the methods previously in use.

That the method is applicable to all cases of dislocated lens, especially those in which the lens is in the anterior chamber, I do not claim. It is even possible that it may be relegated, after further trial, to the list of the curiosities of ophthalmic surgery. The method of inserting a single needle, or a bident, by means of a detachable needle-holder, may prove of value in certain cases of foreign body in the chambers of the eye. I recall cases of other foreign bodies than dislocated lenses, in which I would have got valuable aid from it.

EXTRACTION OF A LENS, DISLOCATED INTO THE VITREOUS, WITH THE AID OF DR. C. R. AGNEW'S BIDENT.

By DAVID WEBSTER, M.D.,
NEW YORK.

James B——, aged sixty-eight, a native of Scotland, salesman in a lumber-yard, of correct habits and of good general health, received a blow upon his right eye from a chip of wood which he was chopping some time in November, 1883. There was immediate loss of vision, with severe pain, and considerable ecchymosis of the lids followed. Under the care of his family physician the pain and inflammatory symptoms subsided, but the disturbance of vision remained. This led

him to seek expert advice, and in February, 1884, some three months after the injury, he consulted Dr. C. R. Agnew at the College of Physicians and Surgeons. He was found to have a dislocated lens, but as the eye was "quiet," and as the vision of the other eye was $\frac{20}{20}$, no operative interference was advised. He visited the clinic at the Manhattan Eye and Ear Hospital a few times with like result. From that time nothing noteworthy in his case occurred, except some impairment of the sight of his left eye from incipient cataract, until Friday, May 1, 1885, when he awoke before daylight with a severe pain in and around his right eye. He was, at the same time, attacked with cramps in the stomach and vomiting, which continued through the forenoon. On looking at his eye by means of a mirror he found that it was bloodshot, and that the color of the pupil had changed from black to white. In the evening of that day he was seen by Dr. Neil J. Hepburn, Assistant Surgeon to the Manhattan Eye and Ear Hospital, and to him I am indebted for careful notes of the case. Dr. Hepburn found a cataractous lens incarcerated in the pupil, partly in the vitreous and partly in the anterior chamber. He noted extreme ciliary injection and increased tension, with vision reduced to perception of light. He applied a four per cent. solution of cocaine hydrochlorate freely several times, at intervals of a few minutes, but this had no effect in relieving the pain. He then resorted to the use of the sulphate of atropia, a solution of four grains to the ounce, which gave considerable relief, but which did not release the lens from the grasp of the pupil during the time that he remained with the patient. The use of atropia was continued, at regular intervals, until I saw the patient the next day at 3.45 P.M., along with Dr. Hepburn and Dr. M. Donnelly. The lens had, by that time, become disengaged from the pupil, and was lying loose in the vitreous humor, a portion of its periphery presenting at the lower border of the pupil. On the slightest movement of the eye it floated about freely, appearing to have no attachment in any direction. The pain had mostly passed away, and the tension of the globe was nearly normal. The eye was still very red, however, and the vision had not risen above perception of light.

Having decided to attempt the extraction of the dislocated lens, a four per cent. solution of cocaine hydrochlorate was dropped into the eye half a dozen times at intervals of a minute or two, the eyelids were separated by a Græfe's speculum, and the conjunctiva of the upper part of the eyeball was seized with fixation forceps in order to steady the eye. Dr. Agnew's bident was then passed through the temporal side of the eye-wall, the points of puncture being about three millimetres back of the sclero-corneal junction, and was swept around back of the floating lens, which was easily pressed forward into the anterior chamber and against the cornea, by depressing the handle of the instrument and thus elevating its points. The bident was then pressed forward and made to transfix the nasal wall of the eye, the points of counter-puncture being about two millimetres from the limbus corneæ.

The lens being thus safely secured in the anterior chamber, I made, with a Græfe's knife, an incision downward of about the same size and position as in ordinary cases of cataract extraction. I then tried to pass a wire spoon between the lens and the bident, but failed to do so because the latter had been pressed too firmly against the former before transfixing the opposite wall of the eye. The central portion of the lens evidently protruded backward between the prongs of the instrument. I therefore withdrew the bident, and the lens, remaining where the bident had placed it, because adherent to the cornea, was removed with the spoon without difficulty. The speculum was quickly removed, so that only a few drops of vitreous escaped. A flannel bandage, with absorbent cotton, covered with a black silk mask, constituted the dressing. Dr. Hepburn took charge of the patient, and I did not see him again till after his recovery.

The bandage was removed on the fourth day, and a drop of a four-grain solution of eserine was instilled to draw the iris away from the wound. The eye was opened and carefully inspected on May 9th, seven days after the operation. The wound had healed, and there was an adhesion of the iris at its outer extremity. The patient easily counted fingers with the eye, although some lens-matter still remained in the pupil.

At no time after the operation was there any pain. The lens-matter gradually settled down and disappeared by absorption, while by the use of eserine the synechia became so attenuated and stretched that the pupil was nearly circular.

June 15th.—R. V. = $\frac{6}{20}$, made $\frac{20}{20}$ with $+\frac{1}{40}$; L. V. = $\frac{20}{70}$, made $\frac{20}{40}$ with $+\frac{1}{36}$. The patient has been attending to his business since June 1st.

July 13th.—R. V. = $\frac{20}{160}$, with $+\frac{1}{40}$. So far as my observation goes this case is unique. Here we have a dislocated lens, which has been ploughing about through the vitreous for over a year, and finally becoming accidentally incarcerated in the pupil, and setting up a glaucomatous inflammation, threatening the destruction of the eye, removed with very little difficulty, and the eye saved with vision sufficient to rank as a "success" after an ordinary cataract extraction. Before the invention of the bident such an eye would probably have been enucleated for the relief of pain and to prevent possible sympathetic inflammation. Or perhaps an iridectomy or a paracentesis would have been performed, leaving the dislocated lens in the eye, with all the conditions necessary to repeated attacks of inflammation, leading possibly to total blindness. With the bident I believe many an eye will be saved which, without it, would have been inevitably lost. It may not be applicable to all cases of dislocated lenses. I certainly should not use it where the lens is already dislocated into the anterior chamber, or even where the dislocation was only partial, but in all cases where the lens is floating about in the vitreous, and can be brought into view, I think the instrument may be used with advantage. Without the bident I do not think it is always possible, even when the dislocated lens can be plainly seen, to remove it from the eye, even with great loss of vitreous. If a lens, becoming dislocated during the initial steps of an ordinary cataract extraction, sometimes disappears in the depths of an eye, and cannot be fished out with hook or spoon by the most expert operator, how much more liable is such an accident to occur in a case where the lens is already loose in the vitreous. But if with the bident you press the lens into the anterior chamber and hold it there,

you are not only sure of getting it out of the eye, but its presence acts as a kind of a plug to the pupil, preventing escape of vitreous. The objection to wounding the ciliary body in this way I do not consider a grave one. The clean punctured wounds heal without much secondary cicatricial contraction, and, in the two cases in which I have seen it used, have left no visible scar. Those who have practised "Hancock's operation" for glaucoma, which is essentially an incised wound of the ciliary body, say they have never seen sympathetic inflammation result from it.

I shall close this paper with citations from two of our well-known text-books on the eye.

"If the lens is completely dislocated into the vitreous humor, and is setting up no disturbance, it is wiser not to interfere. But if inflammatory complications arise, or the sight is much impaired by the lens floating about across the pupil when the eye is moved, it will be best to remove it. . . . The operation is, however, very dangerous, for a considerable amount of fluid vitreous will be lost, and severe irido-choroiditis, with subsequent atrophy of the globe, may supervene." (Wells.)

"The removal of the lens is especially indicated in cases in which inflammatory symptoms have already appeared. Unfortunately, the removal of the lens from the vitreous involves so great a loss of that fluid, while the difficulty in extracting the lens is so great, that the operation can hardly be said, at present, to come within the sphere of practical surgery, and it is better in such a case to enucleate the eye." (Juler.)

DISCUSSION.

DR. KNAPP.—I am the colleague whom Dr. Agnew mentions as having seen his patient. The eye kept quiet for a long time. When it became irritated, I advised enucleation, but the timid patient did not consent. My advice was based on the experience of a number of cases in which I had removed the lens under similar conditions. There was not much difficulty in removing such lenses, but there was slow healing in many cases. In none has there been any sympathetic trouble, but it has come so near to it that I thought it

best not to go into subtleties when nothing but cosmetic appearances could be gained, and that it was best to remove the eye. Under that impression I advised enucleation in the case in which Dr. Agnew successfully removed the lens. The bident is certainly an ingenious instrument. I have gradually gotten into the way of removing lenses by external manipulation. For the past six or eight years, I have not introduced an instrument into the eye for the removal of a lens. After the section and the iridectomy, the speculum is withdrawn, and pressure upward will bring the lens into the wound. This manipulation requires some practice.

The bident will bring loose lenses forward and hold them in position, but I think Dr. Webster's case shows one disadvantage of the instrument. He had to remove it before he could introduce the hook. The question is: Was it altogether necessary? As far as I have experience, these lenses readily present in the wound. I dare say that some may not present, but go deeper into the vitreous, and then some traction instrument is required.

Where there is a degenerated lens, dislocated for a long time, and where there is chronic irido-cyclitis, with total blindness, I would remove the eye rather than try to save a useless and to a certain degree dangerous organ.

DR. E. WILLIAMS.—I want to express my appreciation of the instrument used by Drs. Agnew and Webster, and at the same time to say that my experience in the extraction of such lenses agrees with that of Dr. Knapp. I never invented an instrument in my life and never expect to, but I can understand an ingenious instrument. This is evidently useful in certain cases. In the great majority of cases, the lens can be extracted not only without the use of a fixation needle, but without introducing a scoop into the eye. I do not enter anything except as a last resort, for it is always followed by loss of vitreous, and often by disastrous consequences. I have considerable experience in the extraction of spontaneously dislocated lenses, but for a long time I have not been obliged to introduce any instrument at all.

DR. WEBSTER.—I am surprised to hear of the facility with which Dr. Knapp and Dr. Williams succeed in removing crystalline lenses from the middle of the vitreous humor without the loss of any vitreous. I have never seen it done. I do not see how it is physically possible, for there is a quantity of vitreous between the cut and the lens.

DR. KNAPP.—I said an astonishingly little loss of vitreous.

DR. WEBSTER.—I have seen a number of instances of catar-

act extraction in which the lens was dislocated, and while the operator was trying to get it out, it has slipped back. The more he tried to remove it, the more vitreous would escape, until finally he would have to resort to the spoon. Where the lens is dislocated into the anterior chamber, it is comparatively easy to remove it, but, where it is far back, it is almost impossible to do it without some instrument.

The fact that I had to remove the bident, does not show that it was unnecessary. It brought the lens from the depths of the vitreous into the pupil.

DR. H. W. WILLIAMS.—I should like to make a single remark in regard to the alternative that has been brought forward, of enucleation as the only resort except extraction of the lens. The instrument presented by Dr. Agnew seems to be a valuable one. I have found, in most cases, that the removal of the dislocated lens was not attended with any considerable difficulty. In some cases, I have had it come through the pupil after the use of atropia and placing the patient on his face, so that the weight of the lens would bring it forward into the anterior chamber. Then by a corneal incision, I have been able to remove it.

What I wish to say is, that the alternative of enucleation is a very serious one, and one we should not contemplate except as a last resort, even in cases of complete disorganization of the globe. I have for many years been in the habit of doing evisceration of the ball in cases of panophthalmitis. I remove the anterior portion of the ball and scoop out its contents. The sclera is then sewed together. I have done this without accident and with good results. In those cases in which it is impossible to remove the lens, it seems to me that the thing to be done would be to remove the anterior third of the globe, take out a part or the whole of the contents, and bring the edges together with fine sutures. Generally it is sufficient to leave the contents undisturbed. I have had many cases in which there was a very good result. Enucleation causes a serious loss to the patient, and is not unattended with danger. I have seen one case in which a fatal result followed enucleation, and a number of other cases have been reported, where thrombosis of the veins with fatal results from intra-cranial inflammation have followed this operation.

Last year I met Drs. Horner and Snellen. They called my attention to their doing this operation of removing the anterior portion instead of the entire globe. Snellen said that he now did not remove one eye where formerly he removed six. Horner expressed nearly the same opinion. This opera-

tion gives a much better stump for the use of an artificial eye, than is obtained when the whole eye is removed.

DR. AGNEW.—I may say a word in closing the discussion. The fact that our eminent colleague recommends enucleation in such cases, shows the manner in which such cases have been treated by the best authorities. The fact that our friend on the left acquiesces in the propriety of enucleation in such a case, shows that this like all other questions in ophthalmology is an open one. The dogmas in reference to it are still to be discussed, and there is room for change and improvement.

In regard to the use of the instrument proposed by me, I think that I may safely say that it will lift a dislocated lens with ease, in some cases in which other methods would fail to do so. It is possible that in the case of Dr. Webster, the lens might have been brought out by partly withdrawing the bident, so as to bring its points from the wound of exit so that they moved in an excursion of about a quarter of a circle. As I said before, the instrument may be of value. I recall a case in which a piece of steel half an inch long was in the vitreous, and the eye was enucleated. There I think it might have been used to advantage and the body forked out. I do not acquiesce in the view that the operation of enucleation is a very simple one in all its issues. I think that it is a very serious and sometimes a disastrous mutilation, and should never be resorted to except under the pressure of urgent necessity. The manifold effects upon the patient, the necessity of wearing an artificial eye, with the possibility of the cavity becoming so contracted in time from proliferation of the conjunctival lining as to necessitate the use of a smaller eye or the entire abandonment of it, should make us endeavor to escape the necessity for enucleation, just as the modern methods of antiseptic surgery diminish the necessity for amputation. Limbs are now saved which a few years ago would have been cut off without a moment's hesitation. The facility with which the mere surgical procedure of enucleation is done, I am sure has led me, and may have led some of my colleagues, to resort to it in cases in which I should now be unwilling to employ it. It is a multilation from which it is hoped that the resources of our art will emancipate us to a greater degree. Any step toward saving an eye, without imperilling the fellow organ, is worthy of consideration.

A CASE OF FIBRO-MELANOTIC GROWTH IN THE ORBIT TEN YEARS AFTER REMOVAL OF THE EYE ON ACCOUNT OF A PIGMENTED INTRA-OCULAR GROWTH.

BY F. BULLER, M.D.,
MONTREAL, CANADA.

THE case I am about to describe seems to form a noteworthy exception to the rule that melanotic growths, originating in the eyeball and recurring after removal of the primary disease, soon destroy life.

On the 27th of May of the current year, Mrs. X., residing in the northern part of the State of New York, consulted me on account of a painful affection of the right orbit, which for a number of years had been causing a great deal of discomfort and annoyance. The history of the case, as given in a communication from her medical attendant, is as follows:

"About the year 1863 or 4, Mrs. X. accidentally discovered she was minus the sight of the right eye. The pupil was somewhat dilated, but did not present the appearance seen in fungus hæmatodes or encephaloid of the eye. At this time the optic nerve must have been affected. On ophthalmoscopic examination, I discovered no disease of notice. About the year 1865 she suffered from severe pain in the region of this eyeball, which would shoot or extend from the occiput of the same side to the eye, or from the eye to the occiput.

"About the year 1868 she suffered from an exceedingly severe attack of inflammation of the optic nervous apparatus, eyeball and eyelids, and there were recurring attacks of inflammatory and neuralgic conditions of the lids, eye, etc., till about the year 1872 or 3, when the other eye began to be affected, as I thought through sympathy; this sympathetic affection continued with remissions and exacerbations until it

was evident the left eye too would be totally destroyed. I therefore advised the removal of the right eye, which during all this time was giving her a great deal of pain. She finally consented to the operation, which was done by the late Dr. Robertson of Albany, as near as I can remember, in the year 1874. On cutting into the eyeball after its removal, the vitreous humor was quite dense, not like cartilage, and not solid; it was dark, if I rightly remember it was black, and contained several spiculæ of bone, some of which were sharp-pointed. I preserved for a long time one of these bones, which was one-fourth inch or more in length, and this reminds me that for a year or two she had complained of a pricking sensation in the eyeball, caused no doubt by these sharp points. She made a good recovery from the operation, and the sympathetic trouble in the other eye subsided. After two or three years the same pains and recurring inflammatory affections of the tissues of the lids and orbit reappeared, and have persisted more or less ever since. Three or four years ago the orbit began to fill up. Two years next autumn it was about filled; she then had an exceedingly severe time of pain and inflammation of the surrounding tissues in close proximity to the orbit. The swelling in the orbit burst, and then subsided very much, but in a few months began to increase again."

The remainder of the communication, dealing with the family history of the patient, contains nothing of importance.

In some points the patient's own statements differ from those of her physician. She states, that about a year after the loss of vision was first noticed, the eye swelled up and burst, and then shrank; for some time afterwards she wore an artificial eye, but had to abandon its use because it caused discomfort; that pain in the orbit and head returned within a year after the removal of the eye, and were usually most troublesome during the early part of the night, though sometimes she would scarcely get any sleep all night long on account of the pain; that often after suffering for some hours sudden relief would occur, with a copious flow of tears from the conjunctival sac; that the inflammatory swelling which occurred two years ago subsided without any discharge other than a watery fluid.

In the absence of any minute examination of the diseased eyeball after its removal, the nature of the case cannot, of course, be positively asserted, though there is strong reason to believe the eyeball was filled with a pigmented sarcomatous growth at the time of its removal ten years ago.

The left eye is entirely normal, and shows no sign of antecedent sympathetic trouble. Mrs. X. does not appear to have suffered in her general health, and presents no signs of functional or organic disorder other than that within the orbit. The eyelids on the affected side are slightly swollen and darker than on the other side. There is some lachrymation from the empty conjunctival sac, but the conjunctiva is perfectly healthy. *Only in the centre of the sac there is a small, indistinct, dark colored area traversed by a few dark tortuous veins.* Here, too, the conjunctiva rests upon a firm mass, which is not subject to even a trace of muscular movements.

The orbit is, in fact, two-thirds filled by a firm, somewhat nodular mass, not adherent to the walls of the orbit at its periphery, but not movable to any extent; pressure on the mass from below upwards causes pain, but not from above downwards. There is nowhere the least suspicion of fluctuation.

Without forming a positive opinion as to the nature of the growth, though the dark patch over its central portion was strongly suggestive of its pigmented character, I advised its removal, with a view to relieving the almost constant pain caused apparently by its presence. To this the patient readily consented. The tumor was removed June 3d.

In order to get plenty of room I divided the outer canthus, then dissected back the healthy conjunctiva; with curved scissors and the fingers I removed first an isolated ovoid mass, of a dark brown color, enclosed in a delicate capsule and having a somewhat lobulated surface; this mass, 2½ c.m. in length, 2 c.m. wide and 1 c.m. in thickness, was quite firm in texture. After its removal the apex of the orbit was still occupied by a considerable quantity of softer material, which was cleared out with the curved scissors as completely as possible, and when the moderate bleeding had ceased chloride of zinc paste was applied to the deep portion of the orbit in the usual way.

The patient made a satisfactory recovery, and returned home at the end of a week. As yet there is no return of the growth and she is free from pain.

The ovoid mass first removed showed on section a mottled appearance, being divided into lobules, of a dark color and irregular as to size and shape, by broad bands of pale fibrous tissue. The central portion of the lobules was made up almost entirely of cellular elements, but even here, in thin sections, logwood staining brought out a delicate linear meshwork of white fibrous tissue, so arranged as to give the cellular elements the appearance of being placed in rows in its long meshes. In parts the cells were nearly all crowded with granules of golden brown or black pigment, which for the most part was pretty uniformly distributed through their plasma; very few had more than one nucleus, which was always very distinct.

In certain localities pigmented and non-pigmented cells were present in about equal proportion, and in others none were pigmented. Throughout the growth the prevailing character of the cells was spindle-shaped with long processes, or oat shaped, though round cells were present in all the cellular parts and sometimes in excess of the others. Multipolar cells were extremely rare, but not entirely wanting.

As a general thing the non-pigmented cells were smaller than the pigmented, though otherwise precisely similar in character and arrangement. The pale portions of the tumor consisted almost exclusively of white fibrous tissue; the same is true of its capsule or envelope; yellow elastic fibres were also present in peripheral parts. The growth was by no means a very vascular one, though traversed by a network of delicate capillaries.

The larger bloodvessels were characterized by their very thick walls and comparatively narrow lumen, a circumstance which may serve to account in some measure for the slow growth of the tumor; extravasated blood corpuscles were present in small areas here and there, and in some places extracellular deposits of granular pigment, probably of hæmorrhagic origin.

The softer posterior portion, or deep seated orbital growth,

was of a dull red color, and very friable, almost pulpy in its consistence.

Portions of this, treated in the same manner as the preceding, were seen to consist almost entirely of small round cells interspersed with numerous extravasations of blood. In some places blood corpuscles and tumor cells were mixed in nearly equal proportions.

The cells contained very large nuclei; possibly many of them were free nuclei, at least in a few places they had that appearance; similar small round cells were charged with brown pigment granules, but as this always occurred at or in the vicinity of blood extravasations, and with considerable quantities of free pigment, there is some doubt as to the origin of the pigment in cells containing it. Certainly neither the quantity nor the distribution of this pigment would justify us in calling this portion of the growth melanotic. The stroma consisted of a fine granular, slightly fibrillated material. Bloodvessels as such were not discoverable, but in certain small areas there existed an arrangement of embryonic looking tissue which probably belonged to the vascular system, here and there were channels of various widths and enclosing quantities of blood corpuscles, but without definite walls, unless the gradual transition of round to elongated tumor cells, with their long axes parallel to the channel, could be considered as constituting the vessel wall.

It appears from the foregoing that we had to deal with a mixed growth; the first, encapsuled portion, being distinctly fibrous in its character and perhaps best designated a melanotic fibro-sarcoma, whilst the softer deep seated growth was evidently a round-celled sarcoma.

In both cases we are confronted with a wide deviation from the well-known propensities of these growths.

Assuming, as we may, that the primary lesion was a pigmented choroidal sarcoma, the date of its recurrence in the orbit may fairly be placed as the period when the persistent orbital and neuralgic pains returned, that is, within a year or two after the eye was removed, inasmuch as the patient was entirely free from them for a year or two after the first operation, but since

they returned has never enjoyed more than a few days relief at any time. So long as the growth had not extended beyond the limits of the encapsuled portion its presence would certainly not have been revealed to the patient or to an unskilled observer, since it had not obtained a sufficient size to encroach perceptibly upon the surrounding parts and alter their appearance, and in view of its fibrous character it may very well have been growing slowly for years. The tendency to slow or comparatively slow growth in the more fibrous melanotic tumors is, I believe, generally admitted, but I have not been able to find any case on record that so strongly emphasizes the principle or law as this one does.

Then again the round-celled, deep-seated growth can hardly have originated later than four years ago, when the orbit was found to have become nearly filled up. The sudden enlargement and inflammatory attack of two years ago may have been due to a hæmorrhage in its substance, and the obvious tendency to extravasation discovered by the microscope renders the truth of this assumption highly probable. Nevertheless the inflammatory attack might reasonably have been expected to excite the tendency to rapid growth which round-celled sarcomata are well known to possess. This, however, clearly did not occur, and in spite of the apparently favorable condition for rapid development, the case preserved its original torpid character to the end, and it is to be hoped the anticipated recurrence may follow in the same line.

I have been unable to arrive at any satisfactory explanation of the pain having been so conspicuous a symptom throughout the past ten years. There was certainly nothing in the nature, size, or position of the growth that should have rendered it the source of great pain; but the freedom from pain since its removal is, to say the least, strongly suggestive that the growth and the pain bear to each other the relationship of cause and effect.

BONY TUMOR OF ORBIT (CYSTOID), CAUSED BY AND ENCLOSING FOREIGN BODY.

By B. E. FRYER, M.D., U. S. Army,
KANSAS CITY, MO.

THE case of bony orbital tumor which I am about to very briefly describe, is of interest from its diagnostic bearing on orbital growths generally.

CASE.—Massy Kibbo, colored, six years of age, of good health, development, and physique; free, as far as could be ascertained, from any hereditary taint, was brought to me by his mother, April 25, 1885. I found that the child had a large swelling of the left orbit, which began just above the superciliary ridge, extended outwards as far as the external angular process of the frontal bone, and projected forwards about an inch higher at the orbital edge than that of the fellow. The tumor included the whole line of the ridge, and extended downwards and backwards into the orbit, displacing the eye downwards, forwards and outwards very markedly. The growth, which was solid, was too hard apparently for cartilage, and yet not quite dense enough for bone. At the line of its first elevation above the superciliary ridge, it was not possible to define exactly where frontal bone ended and tumor began.

The only history obtainable was that the boy, two years previous to his being brought to me, while stooping in front of a stove and holding some kindling wood in his hand, was pushed forwards by another boy, and his forehead slightly cut by a piece of the wood. It was insisted by the mother that none of the wood lodged in the wound, that the cut was very slight and that it healed very shortly. No cicatrix was now visible. The tumor began to appear after the injury, and had been growing steadily since. There was little or no pain in

it. A diagnosis as to the character of the growth was not made at once, but it was decided to explore and remove.

On the 1st of May, 1885, assisted by Dr. G. Hulley, professor of surgery in the Kansas City Medical College, and by Drs. Rathbone and Cressap, I operated. Making an incision just above the supra-orbital ridge about 1½ inches in length, I dissected a flap upwards and one downwards. Coming upon the growth, which I had expected to be possibly sarcomatous, I found, however, a dense tumor, continuous above with the frontal bone, and projecting downwards into the orbit, of a whitish yellow color and quite opaque. I now diagnosed (and so told my friend Dr. Hulley) a bony cyst, and that in it would be found a foreign body. This proved to be the condition upon cutting into the tumor with bone instruments. At about half an inch below the surface of the growth and near its centre, I discovered this piece of wood which I exhibit. It is 6 m.m. long by 3 broad and 1 m.m. thick. It was enclosed in bone on all sides, with a small quantity of pus directly surrounding it; its position being about the middle of the supra-orbital ridge, but above it. The long diameter of the wood was at right angles to the frontal bone.

I then, with bone forceps and chisels, levelled off the growth and worked downwards and backwards into the orbit and removed such of the enlargement as existed there. On completing this, the eye returned nearly to its normal position in the orbit. The edges of the wound were brought together with catgut ligatures, and healing, with the exception of a small portion of the outer end of the wound, was obtained per primam.

I have not been able to find the history of a similar case recorded in ophthalmic or in general surgery, but in the latter I remember seeing a somewhat pathologically similar case, where a foreign body, which had remained on the femur for a year, had become partially surrounded by new bone.

In the orbital case I have just described, the deepest portion of the foreign body was above the normal surface of the frontal bone, showing that the piece of wood had probably penetrated, at the time of the injury, the periosteum only.

It would have probably been more correct to have called this growth a tumor of the frontal bone, but from its bearing on the diagnosis of orbital tumors, and from the fact that the orbit was involved, I decided to speak of it as an orbital growth.

DISCUSSION.

DR. MITTENDORF.—Might not the explanation of the formation of bone be that the periosteum was lifted up by the foreign body, and that from it the new bone was formed?

DR. CARMALT.—These cases have a practical bearing in regard to operation. Dr. Buller's paper shows that after a complete operation with enucleation of the whole contents of the orbit in an adult, there has been no return of a melanotic sarcomatous tumor. I have recently had a case in which, to me, the propriety of non-interference was evident. A lad, ten years of age, of delicate physique, was sent by a practitioner of the neighborhood, with a little growth which had been discovered the day before, projecting into the conjunctival culde-sac of the upper lid. On everting the lid, I found a little tumor, looking as much as may be like a cock's comb. It was freely movable. It looked like the granulations which one sometimes finds after a foreign body has been lying in the sac for a long time. I removed it, apparently entirely. It was about three-fourths of an inch in length in the line of the lid, and one-fourth of an inch in breadth, with a thickness of a couple of lines. In a few days, the wound was entirely healed. About six weeks later, the patient was brought to me with complete ptosis of that lid. Not only was there drooping of the lid, but there was entire immobility, for on attempting to lift it, I met with marked resistance and found there was a tumor occupying the upper and inner part of the orbit; not attached to the globe at all, and apparently not very firmly attached to the bone above, for I could, with a little force, make slight movement. I gave the opinion that the only thing to be done was to remove the growth, but at the same time said that I must have the privilege of changing my mind with regard to the operation after I had begun it, whether I should go on and enucleate the whole contents of the orbit, or desist from the operation. The following day I proceeded to operate, making an incision through the upper eyelid parallel to the brow, and coming down on the tumor, which I soon found was composed of more than the nodule which had presented externally. It was not firmly attached to the superior bony

wall, but went deep into the orbit. I found the muscles, the superior rectus and the levator palpebræ, were both involved in the growth, and in short that I could not enucleate it. In the operation, it was cut into and found to be very vascular, and I had some difficulty in controlling the hæmorrhage. It was necessary to either remove all the contents of the orbit and apply chloride of zinc to every part, or desist from the operation and let the child die from the continued growth of the tumor. Taking all into consideration, I determined that it was better to cease the operation. I did not believe that enucleation of all the contents of the orbit, even if it entirely removed the growth, which was doubtful, would prevent the return in the cicatrix. I was guided to this decision by the age of the patient. If it had been in an older person, I might have completed the operation, but occurring in a child, it seemed that the constitutional predisposition was so strongly marked that there never would be healthy reparative action in that child's orbit, but that in a few months there would undoubtedly be a recurrence of the disease. The tumor has since grown to involve the whole orbit and surrounding parts, and the child is now lying at the point of death from it.

I sent the portion of the growth removed, a piece as large as a pigeon's egg, to Dr. Prudden, without any history, and asked for a diagnosis. He wrote, that the tumor seemed to be composed simply of muscular and connective tissues, in a condition of intense purulent infiltration ; but that the massing of cells was so dense and regular that it resembled an infiltrating lympho-sarcoma. He would, however, have to know something of the clinical aspects before deciding. On giving these verbally, he at once pronounced it a small round-celled sarcoma.

I relate this case, with its fatal termination, in contrast to Dr. Buller's successful one, as an illustration of the law which I am satisfied the results of operations has established, that in *young children* tumors of the orbit, with an embryonic connective tissue basis (sarcoma and its allies), should not be interfered with, as the disease lies not so much in the tumor itself, which may indeed be removed entirely, but in a constitutional inaptitude on the part of the patient's tissue to maturity of cell development, while if tumors of a similar origin in adults be removed entirely, the reparative process may, and often does, go on to the formation of mature cicatricial tissue.

Tumors of the globe (in children), of a similar character (usually Glio-sarcomas), if absolutely intra-ocular, may be

enucleated with the globe, but after they have in any part escaped from the globe, it but brings our art into disrepute to operate.

DR. KNAPP.—The diffuse tumors in the depths of the orbit are very dangerous to remove. Not very long ago a woman came to me who had such a tumor, with exophthalmos. I shrank from the operation, yet I thought it was my duty to advise, and, if I were asked, to undertake it. She wanted time for reflection. A few days ago, I heard that she had been operated on by "a preliminary enucleation," without touching the tumor, and died a week afterwards.

DR. DYER.—The case I reported some years ago, corroborates the remarks of Dr. Carmalt. The sarcoma was removed three times, and the child finally died.

DR. KIPP.—It is often difficult to say whether or not these tumors are not secondary. The patient comes to us for tumor of the orbit, but in many cases it will be found that there is also a tumor in some other part of the body. I have recently come across a number of such cases. The primary disease is frequently so situated that attention is not attracted to it.

DR. HARLAN.—An interesting point is the simulation of orbital tumors by inflammatory exudation in the periosteum and orbital tissues. I have lately had several cases in which mere local swellings have given strong suspicions of the presence of orbital tumors.

In one case at the Will's Eye Hospital, a year or two ago, it was only the acute character of the disease that threw any doubt on the diagnosis of tumor. There were severe pain and great exophthalmos; the equator of the ball was beyond the margin of the orbit. The acute character of the affection and the history of the case made us suspect an abscess. There was a decidedly localized, quite hard swelling in the upper inner part of the orbit, which could be traced as far back as the finger could reach. An exploratory operation was decided upon. A free incision was made, and the finger introduced. We then found the tumor much less distinct than it had appeared to be before the operation. It was not sufficiently defined to justify any attempt at extirpation. The apparent tumor was the result of an inflammation of the periosteum, accompanied with thickening of the orbital tissues in its neighborhood. The swollen tissues were freely scarified, and a tent was inserted into the wound. The swelling rapidly subsided, and all symptoms disappeared.

Not long afterwards, a patient was brought with decided localized swelling in the upper outer part of the orbit, in the

neighborhood of the lachrymal gland. He had been advised by two surgeons of experience to have the tumor extirpated. The resemblance to a tumor was so strong, that I might have taken the same view of the case had I not known the history of the patient. Six or eight months before he had been at the hospital, with decided syphilitic trouble. I therefore concluded that this was a specific periostitis, with probably inflammatory enlargement of the lachrymal gland. Under heroic doses of iodide of potassium the whole swelling subsided.

A CASE OF EPITHELIOMA OF THE EYELID CURED BY APPLICATIONS OF BENZOLE AND CALOMEL.

By ARTHUR MATHEWSON, M.D.,
BROOKLYN, N. Y.

OWEN DUFFY, laborer, aged fifty, presented himself at the Brooklyn Eye and Ear Hospital, October 31, 1881, with a growth on the lower lid of the right eye projecting outward as a sharp cone two-thirds of an inch. This was covered by a hardened crust, which came off like a cap, leaving a raw granular surface. A portion of the growth, examined very carefully by an expert microscopist, Dr. W. H. Bates, showed it to be a well-marked epithelioma.

Treatment was begun by dusting the raw surface with calomel, and afterwards continued with the addition of benzole brushed over this and the adjoining surfaces, at the suggestion of Dr. Bates, who has records of several cases of epithelioma successfully treated by this latter agent. These applications were made as often as the patient could be induced to return to the hospital, an average of three or four times a week. In about three months the growth had entirely disappeared, leaving a smooth depressed cicatrix at its former site.

March 1, 1885, he again made his appearance, with a granular spot at the outer edge of the cicatrix of the former growth, and the history of an ulceration beginning here about six months before. This was now extending rapidly, but quickly

began to contract under renewed applications of benzole and calomel; was very much reduced when he was presented at the April meeting of the New York Ophthalmological Society, and scarcely noticeable when he left the city, May 1st. July 8th he came again, with a considerable increase of the ulcerating surface, but renewal of the same applications was followed by the same good results as before, and at this date, September 10th, the healing process is nearly completed. The method of application was to first carefully remove all secretions from the raw surfaces, then brush them and the adjoining parts freely over with the benzole, and dust calomel over all.

The advantages of this method of treatment over that by the use of most other caustics are, that the pain is slight and brief, and that while these agents seem to exert a solvent action on the imperfectly organized morbid tissues, the adjacent sound tissues are able to resist this action and protect themselves against any tendency to dangerous sloughing.

DESCRIPTION OF I. L. BORSCH'S SPHERO-CYLINDRICAL COMBINATION LENS, GROUND ON ONE SURFACE ONLY.

By G. C. HARLAN, M.D.,
PHILADELPHIA, PA.

In these new lenses, one side of the glass is ground with two cylindrical curves of different radii, and with axes at right angles to each other. This gives the effect of a sphero-cylindrical lens, and leaves the other side of the glass for any additional combination that may be desired. Here, for instance, is a surface with a — 2.50 D. curve in one direction and a — 6. D. curve in the other. This gives the effect of — 2.50 s. ⌒ — 3.50 c. The other side of the glass is plain. If, now, a + 2. s. curve be ground on the plain side, we have — .50 s. ⌒ — 3.50 c. It will be seen at once that this admits of a great variety of combination. A glass ground on one side

with the same curves as above, but plus instead of minus, and on the other side with — 2.50 s., makes a very elegant periscopic + 3.50 c. Any spherical or conical curve, or one or two cylinders with any desired axes, can, of course, be ground on the plain side. As you can see, these glasses are very light.

Mr. Borsch's method of making the moulds is simple and very ingenious. In the usual cylindrical mould the axis is straight, and the glass is ground by a to-and-fro movement; in the new mould the axis is curved, and the glass, in grinding, is given a motion in the direction of this axis, so that another curve is ground at the same time in the opposite direction. Any degree of curvature may be given to the axis of the first cylinder, and, therefore, to the surface of the second curve. A piece of metal, having the curve of the first cylinder, is attached to a pendulum rod whose length equals the radius of the second curve, and is made to swing back and forth over the wet plaster from which the first mould is formed. The metallic mould is made from this, and the same pendulum motion is given to the glass in grinding.

REMOVAL OF A PIECE OF STEEL FROM THE CRYSTALLINE LENS WITH THE ELECTRO-MAGNET.

By JAMES LANCELOT MINOR, M.D.,
MEMPHIS, TENN.

M. S., a marble trimmer, aged thirty, of Vermont, consulted me at the New York Eye and Ear Infirmary, on October 22, 1884, concerning his right eye. A week previously, while hammering stone, a small splinter of steel flew from the *pitching tool*, and struck the eye. The pain was sharp at the time, but soon passed away; the globe became injected and red, but cleared up in a few days. The vision, which was *nil* immediately after the accident, improved somewhat, but still

remained seriously impaired, and it was concerning this that advice was sought. I found slight ciliary injection of the globe; a small recent scar in the centre of the cornea; a tag of adhesion, binding the lower margin of the pupil to the capsule of the lens, from which a small band of opacity could be traced through the somewhat cloudy lens, to a glistening spot in its lower portion, near the posterior capsule. Vision $= \frac{3}{200}$.

There was clearly a piece of steel in the lens, which I desired to remove at once; but the counsel of some of my colleagues at the Infirmary prevailed, and it was decided to await further developments. As the globe was practically free from irritation, there was no urgency for immediate interference; and in event of further development of cataract, the lens could be more easily and safely removed, while there was a possibility that the foreign body might become encysted, and thus render operative measures unnecessary. The patient would not consent to remain in New York under tentative treatment, hence he was given atropine, and was instructed to be on his guard, and to return at once upon the advent of the slightest sign of irritation. The eye remained perfectly quiet until November 18th, when it became irritable, red and painful. The patient returned to New York, and I saw him two days later. Vision was now reduced to perception of light. There was considerable ciliary injection; some discoloration of the iris; slight swelling of the lens, and greater general haziness, though the foreign body could still be seen in the same position. Tension slightly increased. Leeches, warmth, cocaine and atropine, failed to relieve, and I decided to operate. The eye was cocainized, a downward corneal section was made, and that part of the iris which was bound down to the lens was removed. Then, holding a Bradford's electromagnet in the left hand, I placed its tip against the shank of a strabismus hook, held in the right—contact being maintained throughout the operation. The strabismus hook at once became magnetized, and I was possessed of a freely movable, and easily guided point, which was small and curved. The point of the strabismus hook was next introduced

through the corneal wound, into the anterior chamber, and carried to the point where the iris had been removed from the lens, thence into the lens-substance to the piece of steel, which at once became attached to the hook, and was easily withdrawn. The eye was flushed with a saturated solution of boric acid, before, during and after the operation; and as an attempt at an antiseptic dressing, boric powder was freely dusted over the linen pad, which covered the eye, before the cotton-wool packing was applied for the bandage. [The boric acid is readily dissolved by such secretions as form, and the eye is thus kept constantly under its influence.] The operation was painless. The healing process was normal and rapid, and the pain, which before the operation had been severe, did not again return. Thirteen days after the removal of the foreign body—the eye having completely recovered from the effects of the operation—the patient was allowed to return home. The lens was more hazy than before the extraction of the piece of steel, but was not completely opaque. The patient reported again in a month, and was last seen in February. The lens was not completely opaque, and it was considered safer to postpone its removal. The eye was in a normal condition in other respects. Vision $= \frac{6}{20}$.

This case is related chiefly on account of its rarity, but in part because of the happy result obtained, and as an illustration of the methods adopted in its accomplishment. Early in my use of the magnet, I experienced some difficulty in manipulating rather an unwieldy instrument for the interior of the eye, with sufficient precision and delicacy, and I soon learned to reinforce the magnet, by holding its point in contact with the instrument that I desired to use. The magnet holds the instrument firmly in contact with its point, which, acting as a fulcrum, allows the most varied movements, with considerable delicacy of manipulation. The utility of thus converting almost any instrument in an operating case into a magnet as well, bespeaks its own commendation and application.

Note.—About the 20th of July the patient returned to the Infirmary to have the cataract removed. The lens-matter had be-

come almost entirely absorbed, and but little remained of the lens, beyond the thickened capsule, which, in superficial area, covered about the same space that had been previously occupied by the lens. I cocainized the eye, and after making a downward corneal section, attempted to catch the capsule with a sharp hook and remove it. Its ciliary attachments were too strong, however, and, fearing that traction would be injurious, I went in with Wecker's scissors, and succeeded in making two incisions, which were widely separated below, and converged toward each other above, so as to come together about the upper margin of the lens; then, catching the upper end of this angular flap with a sharp hook, and withdrawing it, I cut it off with Wecker's scissors at its base—thus getting out most of the cataract, and leaving a large, clear triangular opening. The eye was bandaged and treated in the ordinary way, and the patient was allowed to return home in about ten days. The healing process had been normal, and vision was at this time $\frac{20}{100}$. My removal from New York prevented further observation.

NINE SUCCESSIVE CASES IN WHICH THE ELECTRO-MAGNET WAS USED FOR THE REMOVAL OF FRAGMENTS OF IRON FROM THE INTERIOR OF THE EYE.

By H. KNAPP, M.D.,
NEW YORK.

A FEW weeks ago, when I received the instructive monograph of Hirschberg on the use of the electro-magnet in eye-surgery, in which he reports thirty odd cases from his own practice, besides quoting those that had been published by others, I looked over the books of the New York Ophthalmic and Aural Institute and found that the magnet had been used in nine cases since January, 1882, a number of previous cases having been published before. The histories of these nine cases form the substance of this article, but in consideration of the long list of papers on our bulletin, I beg leave, Mr. President, to withdraw it and state the results in a short abstract.

In two cases the chip of iron was lodged in the *iris*. In

the one it had entered only the day before, and was surrounded by yellowish-gray exudation. The magnet, introduced through a corneal incision, failed at first, but brought the foreign body out after it had been freed from the exudation with a hook. Recovery with perfect sight, a round pupil.

In the second case a fragment of steel had lain quiet in the iris seventeen years, producing iritation only of late. It was drawn into a corneal incision by the magnet, seized and drawn out with the adjacent iris. Recovery, with a small coloboma, without anterior or posterior synechiæ.

In the seven remaining cases the foreign body had produced cataract and more or less opacity of the vitreous. It was situated in the *vitreous* and could not be seen; neither could it be localized by the help of special symptoms, such as defects in the field of vision, denser circumscribed opacity of the vitreous, laceration of the retina and choroid. In regard to the fact that foreign bodies as a rule will sink to the bottom of the vitreous chamber, a meridional incision was made, in all cases, into the outer-lower part of the sclerotic, between the inferior and external recti muscles. In three of the cases the foreign bodies were not attracted by the electro-magnet, and the eyes were enucleated at once; in the remaining four cases, the tip of the magnet brought, on the first, second, or third attempt —more I never make—the foreign bodies either out of the eye or into the wound where they could easily be seized and extracted. Recovery without suppuration in all. No irritation in eyes afterwards. The patients were discharged with good perception of light in the whole field, but in one a slight shrinkage, with a defect in the visual field, developed in eighteen months; a similar result, I suspect, took place in a case which I could not follow up; in a third, after two years, the eye is reported normal except the cataract; in the fourth —from the service of Dr. T. R. Pooley—the shape and tension of the eye, and the visual field are normal, but the time elapsed since the operation is only five months.

Though I have not seen, thus far, sympathetic ophthalmia develope after any of the operations in which I employed the magnet, the visual results obtained have been quite insignifi-

cant, except when the fragments of iron were lodged in the anterior parts of the eye, from which most of them can safely be removed without the use of the magnet. In the removal of iron and steel foreign bodies from the eye, I consider the electro-magnet is an aid that should always be at hand. When the fragments lie invisible in the vitreous, they can be removed with the magnet only, or not at all. The preservation of the eye, free from irritation even if blind, is a sufficient gain to lead to a trial of the magnet in most of these cases. If the attempt fail, or injure the eye considerably, enucleation should not be delayed.

THREE ADDITIONAL CASES OF HYPERMETROPIC REFRACTION, PASSING WHILE UNDER OBSERVATION INTO MYOPIA.

By S. D. RISLEY, M.D.,
PHILADELPHIA, PA.

In the American Journal of the Medical Sciences for October, 1880, the writer placed on record, with careful detail, the history of four cases, in which the existing hypermetropia, having been demonstrated after the prolonged use of a mydriatic, was observed to pass, with attending choroidal disease, over into myopic refraction. At the meeting of this Society in 1884, a fifth case was presented, where the symptoms, extending over many years, had simulated serious nerve disease. The object of the present communication is to place on record in the annals of the Society a brief account of three additional cases, in which, under like conditions, this change in the refraction of the eye was observed.

The motive which prompts their publication is, not only their intrinsic interest, but also because they give added testimony for the conclusions formulated in the writer's report on the examination of the eyes of the school-children of Philadelphia.—(Trans. of the Med. Soc. of the State of Pennsyl-

vania, for 1881.) It was there claimed, from the findings in that work, that the increased percentage of eyes with myopic refraction, in the higher classes, were recruited from those which started upon the tasks of school life with hypermetropic astigmatism, since these, next to myopic astigmatism, were shown to present the highest percentage of pain and disease, the existing pathological changes being similar to or identical with those changes usually regarded as characteristic of myopic eyes, differing, if at all, only in degree.

Case I.—Maggie H., aged twenty, weaver, presented herself in 1877 at the eye clinic of the Hospital of the University of Pennsylvania, having been struck on the right eye by a shuttle. The eye-ball was removed. In October, 1879, she returned, complaining of headache, with severe pain and impaired vision in the left eye. V. $= \frac{20}{100}$. The ophthalmoscope revealed a high grade of H. As., with much choroidal and retinal disturbance, and a conus below the optic nerve. After the protracted use of atropia sulphate, gr. iv. f℥i., her correcting glass proved to be $+ \frac{1}{15}$ c., axis at 90°, and with it V. $= \frac{20}{40}$. The diminished sharpness was probably due in part to the bad condition of the retina and choroid. Her headache had however disappeared, and with her glass she returned once more to her weaving, and for many months was free from trouble. In December, 1880, she returned with impaired sight. V. $= \frac{20}{120}$ with her glass. She was in ill health, manifesting very plainly the physical evils consequent upon her life in the mill. She was therefore kept from her work, atropia solution being once more instilled three times daily for one week, and careful attention given to her impaired general health. Protecting smoked glasses were worn in the light. Her correcting glass now proved to be $+ \frac{1}{20}$ c., axis at 80° ⌒ $- \frac{1}{30}$ c., axis 170°. With this, V. $= \frac{20}{20}$.

It will be observed that the before emmetropic meridian was now myopic $\frac{1}{30}$, while the hypermetropic meridian had diminished from $\frac{1}{15}$ to $\frac{1}{20}$. There was also a rotation of 10° in the principal meridians.

Case II.—Fanny F., aged sixteen, consulted me in December, 1881, for relief from headache and weak eyes. O. D.,

V. = $\frac{20}{30}$. O. S., V. = $\frac{4}{200}$. She had well-marked retino-choroiditis in both eyes, and was annoyed by photopsies. Her general health was good. She was ordered a solution of hyoscyamin sulphate, gr. ii. f℥ i., to be instilled three times daily. This was continued for five days, with entire relief from the photopsies and headache, and great improvement in the condition of the eye ground. A careful measurement of the refraction now showed as the correcting glasses: O.D. + 1D. c., axis 180°, V. = $\frac{20}{20}$; O. S. — 4.50 D. s. ⌒ — 50c., axis 105°, V. = $\frac{20}{20}$ (?). Soon after receiving this correction she entered the Girls' Normal School of Philadelphia, and pursued the four-years course of study, without any recognized difficulty with her eyes, until near its close. She then, in June, 1885, applied for relief from the head pains and inability to use her eyes for near work. The ophthalmoscopic picture was one of well-marked retino-choroiditis in the right eye, the left being fairly healthy. In O. D., V. = $\frac{20}{100}$ with former correcting glass; O. S. $\frac{20}{20}$, miscalling some letters. The mydriatic was again employed for four days. The pain was relieved, and careful study of the refraction showed no change in the left eye, but in the right the emmetropic meridian (horizontal) had developed M. = 0.75 D., and the hypermetropia in the vertical meridian had diminished one half. She was then ordered + .50 s. ⌒ — 1.25 c., axis vert., V. = $\frac{20}{20}$, and a reading glass securing a common artificial far point for both eyes. Iodide of potassium was prescribed internally. In September (since the meeting of the Society), she again reported, having enjoyed entire relief from her weak eyes and harassing headache, notwithstanding the fact that she had continued her musical studies and had read "almost constantly."

The family history gives added interest to this case. The parents both claimed to have good eyes, but the mother had been a life-long victim to "sick-headache." A younger sister is hypermetropic. Two older sisters came with the patient, also for treatment, at her first consultation in December, 1881. They were both suffering from rapidly progressive myopia, and both had astigmatic eyes. Neither of them were myopic at the beginning of their school life, but were each able to fix

approximately the beginning of their myopia,—one at about her ninth, the other her twelfth year. Both had been great sufferers from headache. During the nearly four years which have intervened since their correction by spherico-cylindrical glasses, there has been no increase in the degree of myopia. Each received a full correction for distance, and a reading glass giving a far point of 15″, combined with 2° prisms, bases in.

Case III.—Viola D., aged sixteen. Came to me October 12th, 1881, complaining of impaired vision and pain in the brow and occiput, aggravated by use of the eyes at near work, or after exposure to artificial light, or at the seashore. O. D., V. = $\frac{20}{100}$. O. S., V. = $\frac{20}{64}$. Insufficiency of interni = 6°. In both eyes the choroid was woolly throughout the eye ground, and there was a defined crescent of choroiditis embracing the outer half of each disc. The atropia solution (gr. iv. ℥i.) was directed to be instilled three times daily. On the ninth day she selected for O. D. — 1.D. c., axis 180 ⌒ + 1.D. c., axis 90°, V. = $\frac{20}{20}$; O. S. — .50 D c., axis 180° ⌒ + 1.50 c., axis 90°, V. = $\frac{20}{25}$. Iodide of iron was administered internally.

Under the treatment and subsequent use of the correcting glasses the symptoms subsided, and she continued her work at school with entire comfort until April, 1883, when her eyes suddenly became painful and V. O. D. = $\frac{20}{80}$, O. S. = $\frac{20}{50}$ with her glasses. A distinct ophthalmoscopic image of the eye ground could be secured only with an additional concave glass. This also improved her vision, but did not give normal sharpness. The mydriatic was again resorted to. Under its use the pain again subsided. A careful study of the refraction now revealed an increase in the myopic, with a diminution in the hypermetropic meridian in O. D., while in O. S., V. = $\frac{20}{20}$ with the former correcting glass. O. D. + .75 c., axis 90° ⌒ — 2.c., axis 180°, V. = $\frac{20}{20}$. O. S. glass unchanged. She then enjoyed a long period of comfort, with occasional attacks of temporary dimness of vision for distance coming on after fatigue, or prolonged use of the eyes at near work.

In April, 1885, she again suffered a return of the former

symptoms with permanent impairment of vision, which came on after extraordinary use of her eyes in writing music. The same method of treatment was again adopted, when it was found that the hypermetropic meridian was still further diminished while the myopic had increased.

DISCUSSION.

DR. SEELY.—I would ask Dr. Risley if he tested the balance of the muscles in these cases? Was there insufficiency of the internal recti?

DR. RISLEY.—In some of the cases there was and in others there was not insufficiency.

THE STOKES' LENS FOR MEASURING ASTIGMATISM.

BY W. S. DENNETT, M.D.,
NEW YORK.

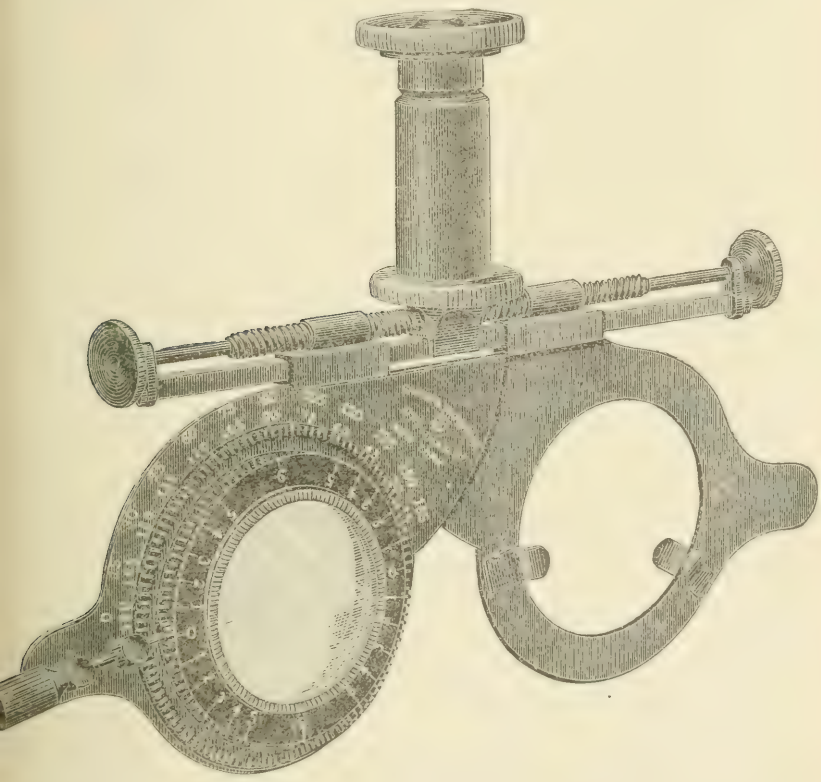
THE Stokes' lens seems hitherto to have been possessed of some intangible and unattainable value as an astigmometer. There are at least four different instruments, the independent inventions of as many different men, in which this lens is the principal factor, but up to the present time it has ranked as little better than an interesting toy.

The attention of the Society is called to an instrument in which it has been found of some use as a rapid and accurate measurer of that part of refractive irregularity which can be advantageously corrected by glasses, and which may be measured without the inconvenience of placing and replacing so many times, the glasses from the trial case.

It is nearly the same instrument which has been previously described in a much smaller mounting, for use on the back of the ophthalmoscope. As here shown it is fastened to one side of a frame corresponding to the trial frames, but so

placed upon a stand as to be easily swung in front of the patient and removed without inconveniencing him by its weight.

The accompanying wood cut will give a very good idea of its form. The lens is placed in front of one eye only, the other side of the frame is left open and has clips which will hold any glass or combination of glasses which is desired. The screw at the top, which supports the instrument, allows of its being turned so that the lens may be placed in front of either eye. It is not necessary to describe the Stokes' lens,



which of course is well known to all, but merely to say that the pinion at O., on the left of the cut as it now stands, turns the two component glasses in different directions, and so changes the strength of the lens without altering its axis,

but by withdrawing the pinion to the outer row of cogs, the whole lens is revolved in the same direction as the lower part, and so the inclination of the axis is changed without altering the strength of the lens.

The milled heads and twin screws extending across the top of the instrument will be recognized as the usual device for adapting the machine to different interpupillary distances.

A diamond mark on either side of each of the glasses shows by its distance from that on the other glass what is the strength of the cylinder represented, and this value may be read from the inner circle of figures. The axis of the resultant glass may be determined by red and white marks, so placed between the upper and lower set of cogs that they always indicate respectively the — and + axes, and the inclination may be read from the two outer circles of figures.

The most convenient method of using the instrument is probably the following:

Choose the spherical glass which gives for the patient the best distant vision, as in the ordinary examination for Hm. or My. Place this glass in position behind the Stokes' lens and set the lens so that it is equivalent to 1. D. cyl.; place this in front of the eye to be examined, pull out the pinion to the outer row of cogs, and revolve as slowly or rapidly as convenient until the letters on the test card are seen most distinctly. In the great majority of cases this will give the inclination of the axis at which the cylinder must be worn, and will require no further correction. Then the number of the cylinder may be determined by pushing in the pinion and revolving as before, until the greatest improvement possible is obtained, when the number of cylinder necessary may be read from the inner circle of figures.

After this it is well to make any needed correction in the spherical glass which has been used behind the Stokes' lens, when the examination is complete.

There is one difficulty in writing the prescription. It is this. Owing to the spherical element which always enters into the Stokes' lens combination, the spherical glass which was used behind the instrument must not be used in the

prescription, but it must be increased or decreased, as the case may be, by a glass just half as strong as the cylinder chosen.

The rule for this change is simple enough, and if any one will take the pains to write it out on a tag and fasten it to the instrument, he will probably never have to refresh his mind by looking at it.

The rule may be written as follows:

Write for either + or — cylinder of the same strength and inclination as indicated by the instrument.

Unite with that in the prescription a spherical glass, equivalent to that used on the back of the instrument, combined with a spherical glass of half the strength of the cylinder chosen and having the opposite sign.

Thus, suppose the patient's distant vision is best with the diamond mark on the glass opposite No. 2 on the inner circle of figures, and with the + axis at 15° and the — axis of course at 105°, and a spherical + 3 behind the Stokes' lens.

The prescription may be written:

+ 2. D. cyl. 15° ⌒ (— 1. sph. ⌒ + 3. sph.),

which of course is equal to

+ 2. D. cyl. 15° ⌒ + 2. sph.

Or if one chooses to write for a — cyl., of course the same optical combination will be obtained by following the same rule, thus:

— 2. cyl. 105° ⌒ (+ 1. sph. ⌒ + 3. sph.); i. e.

— 2. cyl. 105° ⌒ + 4. sph.

Since writing the above paper Messrs. GaNun & Parsons of No. 19 West 42d Street, New York, have made one or two instruments with the Stokes' lens as above described on one side, and a couple of prisms similarly mounted before the opposite eye.

The prisms correspond exactly to Crétès' arrangement. They are manipulated in the same manner as the cylinders above described, and are calculated to save considerable time and trouble in the examination of muscular insufficiency and similar troubles.

The writer has very often found it convenient to set both

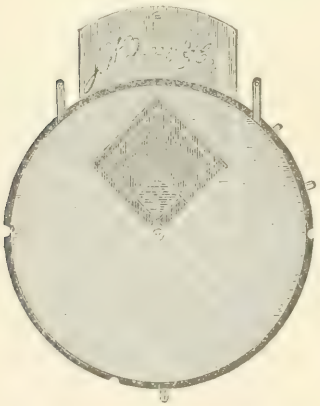
cylinders and prisms at O., and make the above apparatus serve in the ordinary examinations to take the place of the trial frames, thus saving the patient considerable delay and annoyance, as well as weariness, which comes from wearing and rearranging the heavy frames.

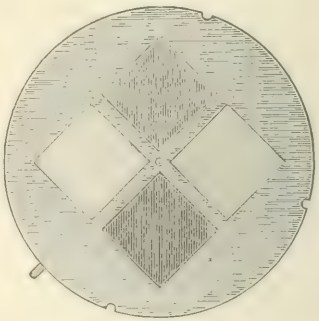
A DESCRIPTION OF SOME MODIFICATIONS IN A COLOR-SENSE MEASURE.

By CHARLES A. OLIVER, M.D.,

PHILADELPHIA.

THE original form of the instrument is described in the December, 1881, number of the "Archives of Ophthalmology." Since then there have been some modifications in the working machinery and additions to the contrivance, of sufficient importance to allow a short description. The plate has been made of zinc, painted dead-black on its outer face. The slide





is composed of dead-black vulcanite, bevelled up on the sides; it runs up and down in two parallel bevelled flat brass rods that are firmly bolted to the back of the blackened disc. The order, number, and character of the colors upon the rotating cards have been changed. The first card has reflected red,

blue, and yellow situated upon it, with an equivalent open area, which when revolved into position, allows the second card to be brought into view: the second color-card contains reflected green, white, and transmitted red (made of a thin plate of gelatine), with an opening which corresponds to that in the first card; while a third card has similarly sized areas of transmitted blue, green, and yellow (composed of thin plates of gelatine, so arranged that new ones of any desired color can be substituted) contained upon it, with an opening similar to those upon the first and second cards.

It will be thus seen that the modified Color-Sense Measure cannot be affected by variations in moisture and temperature, and that any number of colors can be employed by the use of *both reflected and transmitted light.*

A NEW FORM OF REFRACTION OPHTHALMOSCOPE.

By EDWARD JACKSON, M.D.,
PHILADELPHIA.

THE proposal of another new form of refraction ophthalmoscope is probably not a subject for rejoicing; and, by those already skilled in the use of the excellent forms now common, is not likely to be regarded with any excess of favor. Undoubtedly a sufficient variety of forms is already in the market. Still, it must be admitted that heretofore the highest ingenuity of ophthalmologists has been exercised mainly in devising elaborate, complete, and costly instruments, rather than in the attempt to furnish a simple instrument, of the greatest practical value and convenience, obtainable for a moderate expenditure of money.

The instrument herewith exhibited is an attempt in this latter, less crowded, field of invention. It has been designed, not to enable the skilled ophthalmoscopist to measure accurately all possible errors of refraction, but rather to meet,

most simply, conveniently and cheaply, the needs of the student of ophthalmology, or the practitioner of general medicine or surgery.

It may be most readily explained by comparison with Loring's improved tilting-mirror ophthalmoscope, with which all are more or less familiar. The mirror is of the same dimensions, hung in the same way and tilting to the same angle. It might be wider or tilt more. The Rekoss' disk is discarded. Instead, the lenses are placed in two narrow slides, which move vertically behind the mirror, and in front of the disk which shuts extraneous light from the observer's eye. This arrangement makes it thinner than other tilting mirror ophthalmoscopes.

The lens-slides extend down in the stem of the instrument and are moved by buttons which project from the stem forward for the front slide, and to the right and left for the back slide. By these the observer can make any combination of the lenses, without taking the instrument from the eye. These buttons play thirty-five millimetres, or farther, below the aperture of the mirror, and are best moved with the tip of the finger, so it is not necessary to bring the hand up much before the face.

The lenses, selected as most generally serviceable, are: for one slide, plus 1., 2., 3., and 4. dioptrics; for the other slide plus 5. and minus 4., 9., and 14. dioptrics. These give a range of from plus 9. to minus 14. dioptrics inclusive, with a constant interval of one dioptric.

By placing in one slide plus 1., 2., 3., 4., 5., and 6.; and in the other plus 7. and 14., and minus 6., 13., 20., and 27., a range extending from plus 20. to minus 27. can be readily obtained. This latter arrangement would necessitate the projection of the lens-slides some ten millimetres above the top of the mirror when the lowest lenses in the slides were to be used.

Another possible modification would be the cutting off or bending back the sides of the back disk, permitting the use of a circular tilting-mirror.

My claim for this form of ophthalmoscope is: that it gives

the advantages of the best form of tilting-mirror; and a good series, and very convenient arrangement of lenses, in a very light, simple instrument, which will be comparatively inexpensive.

In justice to Queen & Co., of Philadelphia, who have made for me the sample shown, it should be said, that this is the first attempt to embody my idea; that the instrument was constructed directly from my drawings without the intervention of any model; and that it was prepared somewhat hurriedly. These facts must be held to account for any slight mechanical imperfections it may present.

NOTE.—The instrument has since been altered, to permit the ready removal of the lens-slides for cleaning. Five lenses instead of four have also been placed in each slide, giving the following combinations:

Plus 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 6, 7, 8, 9, 10, and 11 dioptrics.

Minus 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 dioptrics.

SOME SUGGESTIONS ON PLASTIC OPERATIONS WITHOUT PEDICLE.

BY B. JOY JEFFRIES, M.D.,
BOSTON.

THE increasing number of successful flap operations without pedicle reported, induces me to make known some thoughts that have occurred to me before I have had opportunity of testing them myself, though having prepared to do so.

Certainly no operator but would gladly get rid of the necessary wound of the arm in obtaining the flap, both on account of the wound itself, its healing, etc., but more especially on account of the delay in the dissecting it up, its preparation, etc. Experience has shown that we cannot depend on obtaining a dissected flap from another person, *as* and *when* we want it. It has also shown that the taking the flap from the

patient's arm or elsewhere is a serious drawback to their willingness to undergo the operation. The piece of skin thus removed does not seem to answer all its purpose. It would be natural that one of more consistence, more vascular and more vital, so to speak, would attach itself with greater certainty and be more easily manipulated. The absence of fat on the under and hair on the upper surface would be very desirable.

The prepuce, it seems to me, offers us the best kind of skin for transplanting; thin, delicate, vascular, with no fat or hairs. As it does not shrink on removal, like other portions of the skin, we can better measure the amount required to be sacrificed. We have a double surface in the part taken off. If our patient is a male, and not a Jew, he may afford us the necessary material with a less disagreeable subsequent wound than that on the arm. If a female, our flap may be got from a male, or, as I would propose in all cases, from circumcised children. The Jewish rite is often enough performed in our centres of ophthalmic surgery to give us ample opportunity of thus obtaining it. I do not find on inquiry that there is anything connected with the rite which would prevent the proposed use of the removed foreskin. As this has a double surface, it would probably answer our purpose as to size. It certainly is the most delicate piece of skin obtainable. I have never heard of its use or the suggestion of its use as a flap.

I would draw attention to one other point. Whilst in many cases one would hardly risk an operation without a flap in releasing the lids, etc., are there not some when the flap could be dispensed with? Certainly nature dispenses with it subsequently, as an inch wide flap disappears to a line wide mark. This does not of course disprove the necessity of its presence during healing. But in reading over carefully the reports from various operators, I thought whether what the flap as used did in some cases was more than retard the healing, and thereby, by letting the parts accommodate themselves, so to speak, with the help of the attached lids, prevent the otherwise natural contraction. I have noticed what others have also spoken of, at least at society meetings, viz., how long you can keep an open wound

in *statu quo* by carbolized oil without carbolic poisoning or other symptom. Would it not be possible to do this, at any rate, with some of the lesser wounds we have after loosening the lids and when these latter are attached to each other? The continued existence of the flap is evidently not necessary, and it seems to me possible to gain what *it* gives us by what I suggest.

DISCUSSION.

DR. WEBSTER.—I was lately reading what Juler says on this subject, and he recommends the foreskin, as Dr. Jeffries has done.

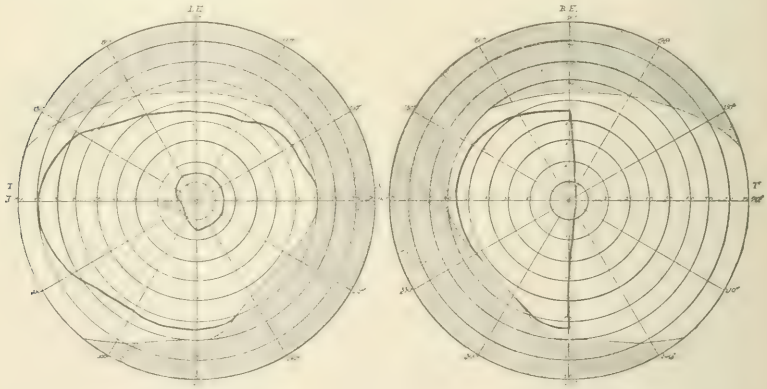
TWO CASES OF UNILATERAL TEMPORAL HEMIANOPSIA.

BY CHARLES STEDMAN BULL, M.D.,
NEW YORK.

UNILATERAL TEMPORAL HEMIANOPSIA, WITH CENTRAL SCOTOMA OF THE OTHER EYE.

COL. N——, aged sixty-six, a retired officer of the army, was first seen in consultation by me on June 28th, 1884, and gave the following history: In the summer of 1849, while at one of the military posts on our western frontier, he was struck by lightning while standing at the door of his tent. He fell to the ground and remained unconscious for several hours. When he regained his consciousness, he discovered that he was blind in both eyes, but this condition rapidly improved, so that at the end of a few days he had regained his sight, and in a short space of time had the perfect possession of all his faculties. He remained perfectly well in every respect till 1857, nearly eight years later, when the muscles of the left thigh and leg began to atrophy, and almost simultaneously there suddenly appeared a temporal hemianopsia of the right eye. The paresis and atrophy of the muscles of the left lower extremity slowly but steadily progressed till 1859,

since which time there has been no change. There has been no change in the field or in the acuity of vision of the right eye since the hemianopsia first appeared. He walks with comparative ease, but the muscles of the left leg are markedly smaller than those of the opposite side, and he easily becomes fatigued. In December, 1883, or about six months before I saw him, he noticed a central obscuration of vision of the left eye, which came on suddenly, and this scotoma has existed ever since, and he thinks has grown larger. He has never had rheumatism or syphilis, has no hypertrophy or valvular disease of the heart, and repeated and very careful examination of the urine has not revealed any signs of chronic degenerative nephritis. He has had intermittent fever of the congestive type several times severely, and during the past six months he has had several attacks of fainting, which have occurred without any warning. He has never been addicted to drinking, and for many years has not touched alcohol in any shape, but he has all his life chewed and smoked tobacco to excess. He was a man of fine physique, with snow-white hair, but with a rather feeble, cautious gait. On testing the



vision it was found in the R. E. $= \frac{15}{30}+$, with absolutely no vision on the temporal side of the median vertical plane of the eye. In the L. E., V. $= \frac{6}{1000}$ eccentrically. A very careful examination of the field of vision was then made and repeated at each subsequent visit, but all the examinations

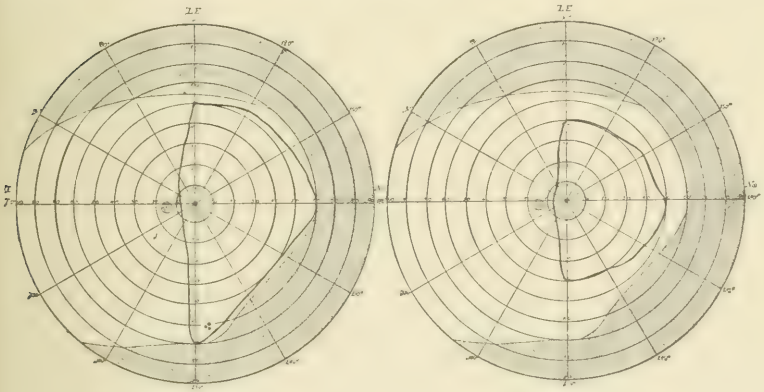
gave the same result. In the right eye there was entire loss of the temporal half of the field. In the left eye there was concentric narrowing of the field and also a central scotoma, which was in shape an irregular oval, with the long diameter, of about 30°, vertical, and the short diameter, 20°, horizontal. An ophthalmoscopic examination showed that the media were perfectly transparent, and oblique illumination proved that the iris was normal in color and reaction. Both optic discs were of a dirty, grayish-white color, and in the left eye the outline of the papilla was ill-defined and at places swollen, as is met with after a neuritis. In each disc there was a deep, overhung excavation, almost glaucomatous in character, with pulsating veins, but no pulsation in the arteries. In the left eye, in the region of the macula, was a large irregular retinal hemorrhage, of the apparent size of two or three papillæ, with its long diameter vertical, which was of a different tint in different portions, showing that there had been several extravasations at different periods. The centre was evidently the oldest in date and the blood had been partially absorbed, giving here and there a glimpse of white sclera showing through an atrophied choroid. The rest of the fundus in both eyes varied but little from the normal in its appearance. The tests for color-blindness showed that in the left eye the color-sense was defective for all but blue, while in the nasal half of the field of the right eye it was normal though sluggish. The tension was normal in both eyes.

Between June 28, 1884, and March 24, 1885, I saw the patient at intervals of three or four weeks, but never discovered any change in the condition of the eyes. On the latter date he complained of seeing what he called a "ball of fire" at times in front of the left eye, of transient duration, which was always followed by a spiral or cork-screw appearance of light, which lasted some seconds. In testing the vision of the left eye at this date, I found that it had improved to $\frac{1}{5}$ eccentrically in the nasal half of the field; but there was no change in the ophthalmoscopic appearances, except a gradual absorption of the extravasated blood in the region of the macula, and no recurrence of the hemorrhage.

UNILATERAL IRREGULAR HEMIANOPSIA, WITH CONCENTRIC LIMITATION OF THE FIELD OF VISION OF THE SAME EYE.

Mr. D. W., aged sixty, was brought to me on March 27, 1885, and gave the following history: On Christmas Day, 1884, while standing on a street crossing, he was knocked down and trampled upon by a horse. When picked up, he was unconscious, and there was an extensive laceration of the scalp covering the frontal bone above the left eye. He was carried in an ambulance to his house, and in the transit regained his consciousness, so that on arrival at his residence he got out with assistance and walked upstairs to his bedroom. He then again became unconscious, and remained either semi-comatose or wildly delirous for about four weeks. Two ribs on the right side were fractured at the time of the accident. An examination of the scalp-wound, which was of an irregular shape and about three inches long, showed that it extended from above close to the hairy scalp, downwards and inwards towards the median line of the left eyebrow. Beneath this laceration was a depressed fracture of the skull, of some considerable extent. The patient was not trephined, but was treated mainly on the expectant plan. Erysipelas of the scalp developed within the first week, beginning at the wound and extending all over the face and scalp. Both eyes were closed from the swelling of the eyelids, and this condition lasted for several weeks. When he regained complete consciousness and the swelling of the eyelids had disappeared, he noticed that he could see nothing on his left side if the right eye were closed, and this condition remained unchanged till I saw him. In addition to the so-called left temporal hemianopsia, he complained that whenever he attempted to write, everything swam before him, but said that he could read with ease for any length of time without fatigue. He had always been hypermetropic, but had never worn glasses for distant vision. An examination showed V. $= \frac{15}{15} +$ in both eyes, and with sph. $+ 2$. D. $= \frac{15}{15} +$. He also read Snellen 0.25 at 10″ with sph. $+ 4$. D. An examination of the field of vision showed

that it was perfectly normal in the right eye, but in the left eye there was a well-marked though somewhat irregular temporal hemianopsia. The color perception was normal in the right eye and normal in the perfect half of the field of the left eye. An ophthalmoscopic examination showed on the right side a normal hypermetropic fundus with clear media, but in the left eye the optic disc was white with clearly defined outlines, and the arteries were reduced in calibre. The tension was normal in both eyes. There was no tenderness on pressure over the seat of the fracture in the frontal bone, nor along the course of the supra-orbital nerve; on the contrary the patient has complained of a numbness along the course and distribution both of the supra-orbital and infra-orbital nerves, since he regained his consciousness. This patient was seen by me at intervals of a few days from March 27th to June 22d, and there has been no change in any of the conditions, except a gradually increasing concentric narrowing of



March 27, 1885. June 22, 1885.

the nasal half of the field in the left eye. His last visit was made on June 22d, at which time a careful examination was again made of the field, and his vision also tested. The accompanying charts show the condition of the field of the left eye at the date of his first visit, March 27th, and of last visit, June 22d; the latter also shows the gradual concentric narrowing of the nasal half of the field. A possible explana-

tion of the visual defect in this case may lie in an extension of the line of fracture from the frontal bone through the roof of the orbit, backwards to the optic foramen, and a consequent injury to the fibres of the optic nerve which are distributed to the nasal half of the retina. There seems to be but little doubt that the amblyopia is progressive and that the pseudo-hemianopsia will end in complete amaurosis of one eye.

DISCUSSION.

DR. ST. JOHN.—I would ask if the urine were examined? In most of the cases that I have seen there has been albuminuria.

DR. BULL.—The last case is gouty, but there is no sign of renal disease.

DR. KNAPP.—In a case of hemianopsia under my observation, the ophthalmoscope showed extensive contraction of the arteries of that half of the retina. This was the only symptom, but it was so marked that I thought that it must be due to atheroma or some other change by which the nutrition of the corresponding half of the retina had been checked. I studied that case very carefully. The gentleman was old. I could not, however, substantiate my view. There was narrowing of the arteries, but it seemed to be owing to contraction of new-formed connective tissue from peri-arteritis.

DR. WEBSTER.—What are the ophthalmoscopic appearances of atheroma?

DR. KNAPP.—I have looked for such for years, but have not found any. In some cases where there were hemorrhages I thought that I could find some. It seemed that here and there was a small white patch or ring in the walls of the arteries, but the condition was not so pronounced that I could say these are the characteristic appearances of atheroma of the retinal arteries. The subject is important. I hope that one of you will be more fortunate than I have been in detecting the symptoms.

STRABISMUS—ITS CORRECTION WHEN EXCESSIVE AND IN HIGH DEGREES OF AMBLYOPIA.

BY E. EUGENE HOLT, M.D.,
PORTLAND, ME.

THE advancement of the muscle at fault in paralytic affections of the eye to correct the diplopia and deformity has been a well-recognized operative procedure for a long time. The question arose with myself, then, why not employ advancement in high degrees of strabismus, in which the weakened, attenuated muscle is practically in about the same condition. And also in high degrees of amblyopia, when, after tenotomy of the muscle causing the deviation, there will be no stimulus to its opponent, on account of the loss of sight, to cause it to contract and correct the deviation of the eye. Disappointed in the results obtained by myself with the usual method of treatment in this class of cases, and constantly seeing persons in whom other surgeons had failed to correct the deformity, I began the practice seven years ago of advancing the weakened, attenuated muscle in conjunction with tenotomy of its opponent which maintained the deviation of the eye. My first case was one in which two operations had already been performed, and I was allowed to operate, on the condition that I would not make the eye any worse. I therefore performed the operation for advancement and tenotomy separately. The result was that the eye regained all its movements, lost its staring appearance, improved in vision, and the cosmetic effect was all that could be expected. More specifically the operation for advancement of one of the recti muscles appears to be indicated:

(1)—When convergent squint is excessive, involving both eyes, amounting to more than 30° exclusive of the hyperme-

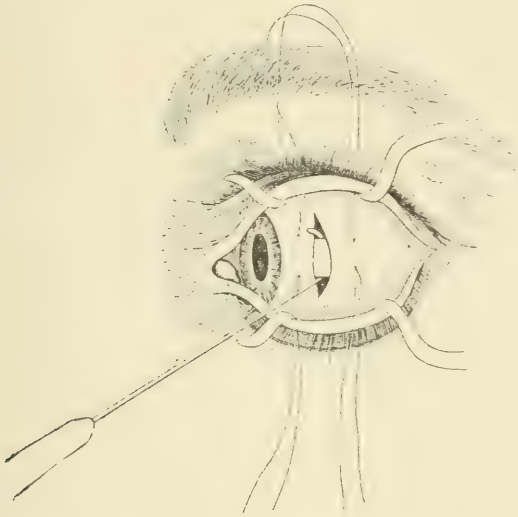
tropia corrected. Tenotomy of both internal recti may be performed, with advancement of the external of the eye in which there is the greater deviation and consequently a higher degree of amblyopia.

(2)—In cases where the squint is confined entirely to one eye and consequently there is a high degree of amblyopia. Tenotomy of the muscle maintaining the deviation, and advancement of its weakened opponent is indicated.

(3)—In cases where the usual operations of tenotomy have failed to correct the deformity, and in others where they have caused a deviation of the eye in the opposite direction.

I have performed the operation of advancement twenty-five times. Twenty-two were done on the external rectus muscle in connection with tenotomy of one or both internal recti muscles, and three were done on the internal rectus muscle, in two of which tenotomy of the external rectus of the same eye was performed. The operation has been performed in several ways, but in by far the larger number of cases it has been done by making the vertical incision near the insertion of the muscle, and advancing the latter by deep and superficial sutures, inserted horizontally. Later I found myself doing the operation by making the vertical incision near the insertion of the muscle (see figure), dissecting down and passing the strabismus hook well back and under the muscle; then a curved needle, carrying a double thread, enters the muscle at its lower edge, at a distance from its insertion varying according to the desired amount of advancement, and comes out at the upper edge of the muscle, forming a loop with the muscle enclosed in it. Then the same needle takes up a loop of conjunctiva and subconjunctival tissue near the cornea, with its entrance and exit at points nearly on a level with those of the first loop formed. By cutting the needle out we have two continuous sutures, securing the muscle and the point towards which it is to be advanced. If it is proposed to tenotomize the opponent muscle, it should be done at this stage of the operation,—then we may proceed to sever the muscle from the globe, cut out some of the conjunctiva that there may be no puckering of it as the muscle is advanced, and in

some cases it will be necessary to cut off some of the muscle. We may now advance the muscle by drawing upon both ends of one of the sutures, and secure it by the first part of a surgeon's knot; then draw up the other suture in the same manner and to the desired amount, and secure it by a com-



plete surgeon's knot. We may cut the threads composing the complete knot off short, but leave the other suture with its half surgeon's knot, when ether has been used, until the patient has recovered from the anæsthetic and we are better able to judge of the effects of the operation. By this method we may increase or diminish the effects of the operation at our discretion. This method of advancement has much in common with that proposed by Dr. Prince, which was so excellent that our distinguished ex-president reproduced it in his excellent book in Wood's Library. It seems to me that its execution is easier to accomplish; but perhaps Dr. Prince's method of tying the sutures, which could be adopted in this operation, would be preferable to that proposed. At first I employed silk sutures, but the annoyance and pain experienced in removing them caused me to try cat-gut, which, being allowed to remain and become absorbed, obviated this difficulty. But

it was found that in some cases there was a localized inflammation connected with the absorption of the cat-gut, causing some elevation of tissue, with a high degree of redness, which lasted for a long time, and in some cases did not wholly fade out. I therefore have returned to the employment of silk sutures, except in cases not seen after the operation; and happily since the discovery of the action of cocaine on the eye no pain is occasioned in removing them. All the operations except one were done while the patients were under the influence of ether. In one case the application of a four per cent. solution of the hydro-chlorate of cocaine rendered the operation quite painless, and the patient, who had taken ether for the extraction of teeth, said she preferred the pain experienced to even the inhalation of ether.

It is important in correcting squint, and particularly in the advancement of the weakened muscle in connection therewith, to carefully estimate how much Tenon's capsule shall be divided in tenotomy of the muscle which maintains the deviation of the eye. The arc of the circle of advancement should be a little more than the arc of the circle of deviation, since it is advisable to have the eye deviate a little in the opposite direction at first, to allow for the cicatricial contraction which is sure to take place in the wound of the tenotomy of the stronger muscle, especially in cases where previous operations have failed to correct the squint. In order to reduce these estimations to the greatest accuracy, it is advisable, in addition to all other data to be obtained in the case, to measure the strabismus in degrees by the perimeter, as advocated by Dr. Landolt of Paris, in whose clinic I first saw it employed. When it is considered that the operation for advancement of the rectus muscle is employed in the worse cases of strabismus, twenty corrections of the deformity out of twenty-five operations, which was the result in this series of cases, may be called a success, for it not only brought the eyes parallel and gave binocular fixation, and in some cases binocular vision, but the eyes were left with but little or no staring appearance, and with good movements in all directions. In the other five cases there was a marked improvement, and it was

no fault in the principle of the operation that they were not recorded as complete successes, since they were unusually bad ones, in which the operation for tenotomy was not extensive enough, and the arc of the circle of advancement was insufficient. Leaving out of consideration the important part the anomalies of refraction and accommodation play in the treatment of strabismus, I will refer briefly to only three cases:

1.—Mrs. B., twenty-six years of age. Vision R. $\frac{1}{10}$, L. $\frac{2}{5}$,—marked squint of right eye 35° with nystagmus (vertical). After a free tenotomy of each internal rectus at different times, a marked deviation (20°) remained with the nystagmus. In a third operation, with advancement of right external rectus and tenotomy of right internal rectus, the eye was made parallel with its fellow, and there was good movement in all directions. There was no nystagmus, and the cosmetic effect was all that could be desired, since it was difficult to tell which eye had been the deviating one.

2.—Girl, aged nine years. Right eye deviates inward 35°, and under all tests appears absolutely blind. Ophthalmoscopic examination negative, except vessels rather smaller than those in the fellow eye.

Since I had never found absolute blindness in the squinting eye, after two days other tests were instituted, and she appeared to be totally and absolutely blind in that eye. The deformity was corrected by advancement of the right external rectus with tenotomy of the right internal rectus. To my surprise, at the end of a week she said she could see with that eye, and on testing her I found this to be the fact, that she could count fingers at 50 c.m. In eight days more she had vision = $\frac{1}{24}$. The vision has improved but little, if any, beyond this point.

3.—Col. B., aged forty-six years. Had marked squint of left eye (30°), with vision $\frac{1}{15}$. The left external rectus was advanced, and the left internal rectus was freely tenotomized. There was marked reaction, in which finally the inflammation involved the whole orbit. By the application of ice cloths, leeches, hot water, etc., the inflammation was controlled, and the result was perfect. This was the only case in which the

inflammation involved the tissues of the orbit or gave rise to any anxiety as to the safety of the eye. In reviewing this case there are causes sufficient to account for the severe inflammation which followed the operation, and although the writer is aware that advancement of a rectus muscle with tenotomy of the opponent is considered a hazardous operation, his own personal experience does not lead him to regard it as such when it has been properly done and the necessary precautions have been taken for such an important surgical procedure.

THE PRESIDENT.—Before there is any discussion, it would be well to have the next paper read.

TREATMENT OF STRABISMUS INTERNUS.

BY W. W. SEELY, M.D.,
CINCINNATI, O.

FOR the greater part of my professional life it has been a question in my mind whether the dicta in regard to operative interference in strabismus should be obeyed.

Each year, with its added experience, has strengthened the conviction that early operations (up to the 12th or 15th year) are questionable and possibly should be entirely abandoned.

The general profession and laity have always held that children "out-grow their squint." But we have all been taught as specialists to combat, in the most vigorous manner, such heterodox ideas.

One of the most recent Text Books on the eye in English, says, in regard to strabismus operations: "These operations ought to be done comparatively early in life. The old story, that the child will out-grow its squint as it gets older, ought to be struck from the list of answers which a physician will give to the inquiring parents in a case of strabismus. The percentage of cases in which a once permanent squint disappears without surgical interference is extremely small, and

I do not think it is ever observed after early childhood." This is truly amazing! Certainly nothing is better established than the relation between ametropia and strabismus, and all recognize the necessity, or possible necessity, of glasses for preventing the recurrence of the squint after tenotomy.

It must be strange if any man has been in practice even a decade of years, and has not seen divergence in cases said to have been perfect corrections of the internal squint for even long periods subsequent to the tenotomy.

But if cases of divergence have not been met with, certainly those of "insufficiency," due to the tenotomy, must have been.

Furthermore, every one knows the possibility of correcting cases of squint by setting aside the ametropia by means of glasses. The exact or even an approximate explanation of the righting of a deviating eye as the individual grows older, may perhaps not be given, but it will undoubtedly come when we cease closing our eyes to the fact.

I do not know how it is with others, but I can safely say, I do not make more than one tenotomy in young persons for internal strabismus, where I would formerly have made ten. I cannot believe that many children of from one to four or even six years of age are operated upon, in spite of all the teaching.

Who has the assurance to say to parents, in private practice especially, "your child's squint will be perfectly corrected by an operation"? Who has reduced the results of tenotomy down to such mathematical certainty?

When we look over our statistics, what per cent. of immediate results are more than cosmetic? My early conviction *that something should be left for time and glasses*, long since grew into an absolute law of action, for I became thoroughly persuaded that *immediate perfection* meant, *later in life, insufficiency or even divergence.*

I think we have advanced so far now, that instead of making *operative interference the first consideration, it should be regarded in the light of an adjuvant, to be resorted to later on if necessary.*

In conclusion, I would submit,—

1st. That with our present light, routine operative interference is wrong.

2d. That to thoroughly correct the deviation in young children by operative interference is extremely liable to subject tham in after life to insufficience, or external squint.

3. That a large percentage of squints can be corrected with glasses alone.

4th. That a later period of life, if anything, favors better results from operative interference.

DISCUSSION.

DR. KNAPP.—I only want to point out the dangers of advancement, and would like to take issue with Dr. Holt in the group of cases of excessive convergence. I have mostly been able to correct the highest degrees of strabismus internus by two operations and stitching the eye to the commissure. In some cases, I have been obliged to make a third tenotomy. I should rather make three tenotomies than make one advancement. Personally I have had no bad luck with it, but I remember that, when a student, I had a conversation with the assistant of one of the most renowned ophthalmic surgeons of Europe. This operation, said I, strikes me as being somewhat dangerous, yet the professor has never said anything about failures. "No," replied the assistant, "he has not, but I have put the artificial eyes in."

DR. THEOBALD.—I can indorse what Dr. Knapp has said. I have never found advancement necessary in convergent squint.

I am astonished to hear Dr. Seely's expression of opinion in his conclusions. There are few operations that I have found more satisfactory than tenotomy for convergent squint. The cases which are likely to be unsatisfactory are those in which the operation is postponed until the squinting eye becomes extremely amblyopic, and central fixation is lost. If we have good vision in both eyes, so that the images are brought on the yellow spot of each eye, I think that a good result can be obtained almost invariably. Out of a considerable number of cases, I do not recollect a single instance in which divergent squint has occurred after tenotomy of the internal rectus. Professor N. R. Smith, who for many years did most of the eye surgery in Baltimore, had a large experience with this operation, and his results were extremely satisfactory. I have seen many of his cases years after the operation, and found the eyes straight. I think there must be something wrong with the operative procedure if it is fre-

quently followed by insufficiency of the internal recti muscles. I seldom cut both muscles at once. After tenotomy, the most satisfactory evidence to me that the eyes are in proper relation is elicited in this way. I cover one eye, usually the squinting one, and allow the patient to fix some object with the other, and very commonly, after a satisfactory tenotomy, the excluded eye will turn somewhat inwards. When the cover is removed, an outward movement of this eye is observed, which proves the existence of binocular fixation.

In my experience, after a successful operation for convergent squint there is, as a rule, a preponderance of power in the internal recti muscles, which manifests itself in the way I have described. I have always performed the subconjunctival (or Moorfields) operation, making the section of the tendon very close to the sclerotic.

DR. WADSWORTH.—I wish to say a word in reference to the theory that the eye becomes amblyopic because the squint remains. After spending a great deal of time in the clinical study of this point, I am convinced that *amblyopia ex anopsia* is a myth. The ability to use the amount of vision which the patient has, certainly does seem to be lost by a continuance of the strabismus, but it may be again recovered by practice. I have been unable to convince myself, however, that the actual acuteness of vision was increased by the operation. Great care needs to be taken to determine the vision in the first place, for it is often difficult to determine the full amount of vision of a squinting eye.

I think that in general, though not always, one may discover some reason why the eye should be amblyopic. If there is no opacity of the cornea, or great error of refraction, or high degree of astigmatism, one may often find irregular astigmatism, which may have been due to some corneal affection, other signs of which have passed away.

I must confess that my experience has not been satisfactory so far as binocular vision after squint operations is concerned. I have seen few cases in which vision was really good in both eyes, and very few cases in which true binocular vision was present after the operation. Even where the vision is nearly equal in both eyes, there sometimes seems to be really a dread of binocular vision. I do not know how to express it better. A striking example of this was observed some twelve or fourteen years ago, in a boy on whom I performed three tenotomies, with the result of bringing the eyes nearly straight. Double images were readily seen, and held, and by the use of prisms it was possible to bring the two images together, but

the instant they came together, there was a jerk and they separated in a vertical direction. I spent hours over that boy, at various times, and the result was always the same, the instant the two images of a candle flame were made to overlap by prisms, they separated again with a jerk. I have seen one or two other cases in which similar dread of binocular vision existed, but none so marked.

DR. BULL.—I differ with Dr. Seely in regard to the frequency of divergence following these operations, but I agree with him in believing that in very many cases of squint operative interference is a matter of secondary consideration, and not to be undertaken until all other means have proved useless. I am glad to hear Dr. Wadsworth speak so positively in regard to his doubts of the existence of *amblyopia ex anopsia*, which doubts I have shared for a long time.

DR. PROUT.—I wish to express a general concurrence with what Dr. Seely has said, and also my sense of the value of Schweigger's views as to the inferior seeing-power of the squinting eye.

A NEW SERIES OF METRIC TEST-LETTERS FOR DETERMINING THE ACUITY OF DIRECT VISION FOR FORM.

(BASED UPON SNELLEN AND DEWECKER.)

BY CHARLES A. OLIVER, M.D.,
PHILADELPHIA.

THE accompanying sheet of test-letters has several advantages not possessed by any other single form of test-card. These are as follows:

First,—The Letter. In order to accurately fulfil the condition of Snellen's basis of letter formation, it was found that the nineteen letters,

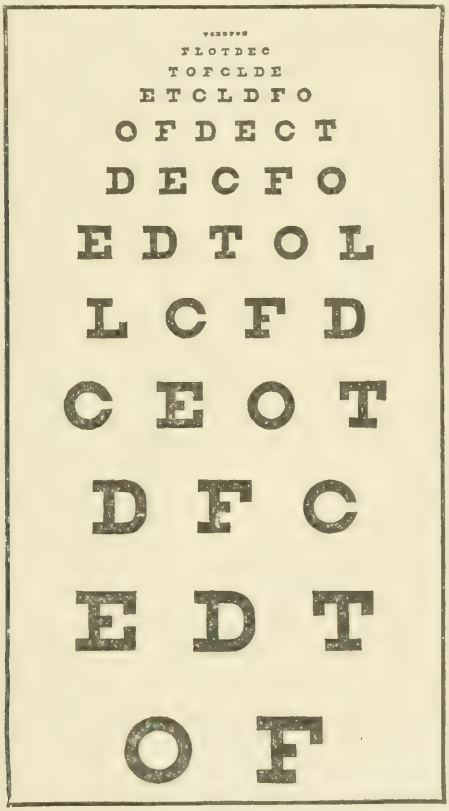
A B G H I J K M N P Q R S U V W X Y Z

had to be expunged, leaving the letters

C D E F L O T

for employment. Each letter used embraces a square area included in a five minute angle for both height and breadth,

and each stroke of the letter is exactly one minute angle in width: further, there is a one minute angle or more of spacing everywhere throughout the breaks and openings in each letter. It will be thus seen that the entire letter is confined to a vertical and a horizontal angle of five minute opening, and that its component strokes are comprised in visual angles of one minute each, whilst in all situations throughout the square, the free spaces are not less than one minute angle in width.



The regular block-letter has been used in preference to any other style of type, on account of its greater conformity to the average variety of character used in printing, which, as is well known, has a foot, head and tail piece; care having been taken to have each piece occupy a square of one minute visual angle.

Second,—The Sequence. Every line is so arranged that its letters follow each other in a certain definite order, though this is rendered incomprehensible to the patient by a system of irregular placing. Amongst the seven selected letters, there are four which are composed of vertical and horizontal strokes, and three which are made up of curved ones, thus giving a series of letters which contain radii at all possible angles. Nearly every line of letters has a complete combination of such strokes situated upon it, so disposed as to make a series of vertical and horizontal strokes follow a series of curved ones; by this means allowing each line to serve as an important adjuvant in the detection and the correction of astigmatism.

Third,—The Interspace. Each letter is surrounded by a space which is greater, or at least equal to its own area. This has been accomplished first, by making each of the intervening spaces between the letters on the same line, of the same area as that occupied by the letter itself; and secondly, by separating the lines from each other by a space equal to the height of the lower letter. It might give the card a more æsthetic appearance to group the larger letters nearer together, but appearance has been sacrificed, and the letters kept at their proper distances, in order to preserve scientific unity throughout.

Fourth,—The Gradation. In a desire to avoid unnecessary mental effort by the use of irregular fractions, and by a wish to render computation easy and quick, $\frac{5}{5}$ instead of $\frac{6}{6}$ has been taken as $\frac{1}{1}$. The order is as follows:

$\frac{2}{1}$,	$\frac{1}{1}$,	$\frac{2}{3}$,	$\frac{1}{2}$,	$\frac{1}{3}$,	$\frac{1}{4}$,	$\frac{1}{5}$,	$\frac{1}{6}$,	$\frac{1}{7}$,	$\frac{1}{8}$,	$\frac{1}{9}$,	$\frac{1}{10}$.	Gradation in Fractions.
v	v	v	v	v	v	v	v	v	v	v	v	Gradation in Dioptrics.
ii$_{1}^{1}$,	v,	vii$_{1}^{1}$,	x,	xv,	xx,	xxv,	xxx,	xxxv,	xxxv,	xl,	xlv,	l.

This mathematical scale was partially made use of by DeWecker, but, unfortunately, it never gained sufficient popularity to be universally employed. The advantages possessed by this change are almost incalculable, and can be justly compared with the superiority that the decimal system of coinage

has over the various other methods of money naming and valuation.

Fifth,—The Reverse Order. By this arrangement, two objects of great consequence are gained. First, time is saved by the want of necessity to have the patient read a great many letters before the proper line is reached; and secondly, a greater probability of correct answers by reason of the eye not having time to become fatigued.

It may be of interest to explain the mode of manufacture of these types. The size of number L type was carefully estimated, and accurate India-ink sketches of the seven letters were drawn to that scale. Photographic reductions to the variously chosen sizes were obtained, the correctness of these being verified by exact measurement. Reverse phototypes were now made of each letter. These were tacked on a large sheet of white pasteboard in the order as they appear on the regular card. They were now rephotographed and rephototyped exactly to the same size.[1]

For the conscientious and painstaking manner in which the card has been prepared, the writer desires to thank the Messrs. J. W. Queen & Co., of No. 924 Chestnut St., Philadelphia, of whom copies may be obtained.

TEST TYPE.

By W. S. DENNETT, M.D.,
NEW YORK.

THE letters which enter into the composition of the test cards in general use for the examination of visual acuteness, are drawn to scale, each one being of a height directly proportional to the distance at which it ought to be seen, and each one being made up of lines whose width is usually one fifth of the height of the letter and a common divisor of its width and height.

[1] Reading types based upon the same plan, comprising the same letters, arranged in a series of small words varying from 0.5 D. to 11 1-11 D., are now in the process of construction, and will be published shortly.

These are the limitations which seem to have been thought necessary and all-sufficient by the makers and users of test cards, and these are the letters which have been in use for nearly a quarter of a century.

It seems quite probable that they were the hurried result of an attempt, on the part of their original designer, to get some scale for the measurement of visual acuteness, which should approximately meet his demand while engaged in the more important work which required such measurement.

It is very well known that good work may often be done with clumsy and inaccurate instruments, if sufficient care and patience be exercised by those who wield them; and while it may not be a matter of great importance to individual oculist or patient to have a more perfect system of type, it is certainly worth our while to be on the lookout for improvements and to do our work with the best instruments at our command, and we may depend upon it that, other things being equal, he who uses the best instruments and methods will do the best work.

The test type which most of us are in the habit of using, though constructed with some degree of symmetry and uniformity, and quite likely to meet the approval of a mathematically inclined sign painter, are not very well adapted to the work for which they are made.

Take, for example, the card which is most frequently seen in the office of those who estimate and record by the use of the decimal and metric systems. The line by which the patient is expected to demonstrate that his refractive and perceptive apparatus is in perfect condition is composed of thirteen letters, M R T V F U E N C X O Z D, all of the same height, each one of which is—erroneously—supposed to be of such size that it can be distinguished from every other letter at a distance of five metres.

No one who has used this card for any length of time but realizes that though there are thirteen letters in the top line, it is practically composed of three or four, and that it is in most cases a test dependent on the patient's ability to see that the first letter is an "M" and to distinguish between the "O" and the "D" at the latter end of the line.

It has been demonstrated by many trials that T and U and V can be seen about half as far again as B and S, and that other letters made in conformity with the above scale might be placed two, three, or even four lines below that in which they are found, and in this manner their usefulness for the purposes for which they were made be increased rather than decreased.

My friend Dr. W. W. Murphy, of Kansas city, and myself have experimented at some length for the purpose of determining the ability of emetropic eyes to see different letters of the same alphabet, at different distances, and find the results quite constant in regard to the relative place occupied by certain letters. For example A, L, U, V, and I, were always at one end of the alphabet and could be distinguished much farther than B & S, which always placed themselves at the other. Other letters took intermediate places, and after a number of experiments the following arrangement was adopted as giving to each letter its relative value: B S Q O Z P N H R K F C G E D J X L M W Y V T A I U.

The examinations were all made in a bowling alley of one of the New York Club Houses, from which all light had been excluded except that given by two 16 candle Edison lamps, so arranged as to illuminate each letter in a definite and measurable manner. The light thus given was equal to that of one candle at a distance of ten centimetres from the letter, and situated in a plane inclined at 45 degrees to that of the surface on which the letter was exposed. The letters were made with India ink on white paper. Each letter was fastened to the screen opposite the observer, who walked slowly toward it until he was able to distinguish it from one or two of those which it most resembled and with which it was most likely to be confused.

This was found to be a much more satisfactory method than that of exposing all the letters at once, and gradually approaching until one by one they could be distinguished. In this latter case the eye became wearied or seemingly dulled in its perceptive power after the first half minute, and could not be depended on for anything like uniformity of result. But in the former method the eye was equally fresh for each

letter. The letters were all .025 metres in height, and made in exact imitation of those on Monoyer's card.

The following were the distances at which each letter could be distinguished, the observer having both eyes open and corrected when necessary for any error of refraction which might exist. No experiments were made with persons who had not a record of perfect vision, according to ordinary methods of examination.

B & S	could be seen	at a	distance	of 10.3 m.
Q O	"	"	"	11.5
P Z	"	"	"	13.
K R H N	"	"	"	13.4
G C T	"	"	"	13.7
E D	"	"	"	14.3
X J	"	"	"	14.9
L	"	"	"	15.2
M W	"	"	"	16.1
Y V	"	"	"	16.7
T	"	"	"	17.3
A I	"	"	"	17.6
U	"	"	"	17.7

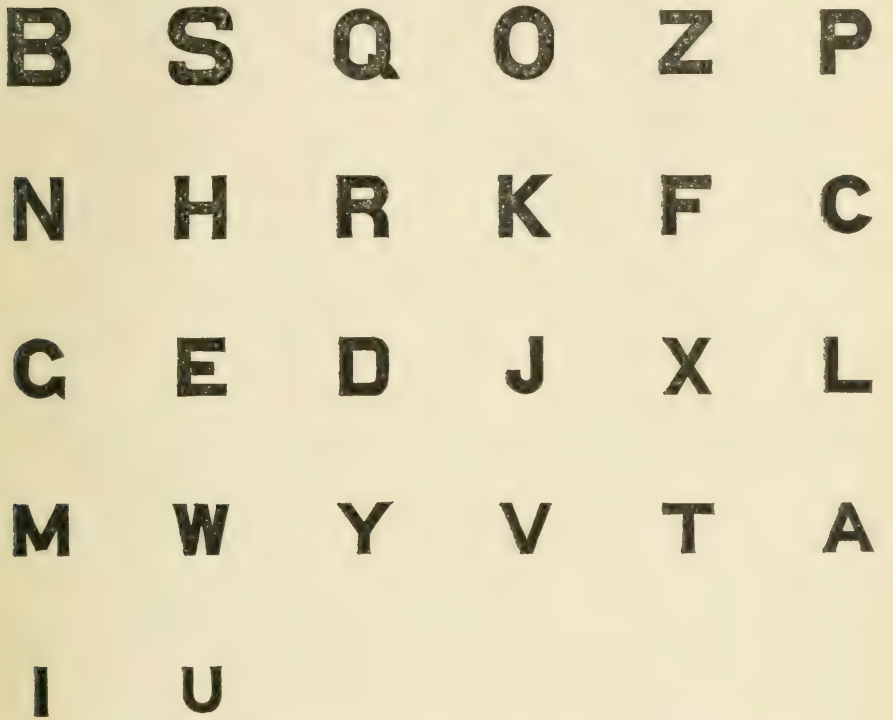
Each letter was then reduced to the geometrical equivalent of B and S, which were the most difficult to distinguish. I have the pleasure of showing here the original drawing. The accompanying cut (p. 137) has been reduced by a photo-engraving process to that size which is likely to be of use for a test at five metres.

It is the intention of the writer to send to each member of the Society certain cards made up of letters reduced to their proper size in accordance with the above experiments, and he will consider it a great favor if they will coöperate with him by calling his attention to any letter, the size of which has been wrongly estimated.

A word or two concerning *a priori* considerations.

Let us assume that the retinal elements of perception are arranged in quincunx order, and more closely grouped near the macula than at any other place, and so with uniform standards of black and white the visibility of objects would very likely depend on the number of contiguous elements which were covered by their retinal images. This assumption gives us a certain amount of hypothetical material with which

to work. It makes it possible for us to establish certain mathematical relationships between the simpler kinds of figures, and suggests to us that we may analyze the letters which we are in the habit of using, by dividing them into groups which shall correspond to the more simple geometrical designs that might be made to do duty in their place.



It is fair then to assume that a square and a circle of equal area (not of equal height) may be seen at the same distance, or more nearly so than similar figures equal only in altitude. And it would seem natural to expect that the visibility of irregularly shaped figures would correspond approximately to the area of the circles which could be inscribed in them.

Though the letters which we use are made entirely of lines whose transverse section fills an angle of exactly one minute in the visual concavity, these lines join and cross each other so often and in such varied directions (the angle varying from 11°.32′ to 90°) that the shortest line which can be

drawn through very many parts of the letters, subtends an angle of more than 2″. So that the letters are distinguished by the magnitude and grouping of the masses of black where one line crosses another, and not at all by the ability of the eye to see a line of given breadth at a given distance.

Below are some of the figures formed by the crossing of the lines used to make the letters, and it will be readily seen that there is little or no uniformity to be expected in the distance at which these different shapes can be distinguished.

The area of the inscribed circles vary from 1 to 2.63, and the only letters which depend for their visibility on the ability to distinguish a line of given width at a given distance are the I and the U, in which the line does not cross or return upon itself in such a way as to make larger groupings of black surface.

The same might be said of the O and the C, but these belong to that group of letters which like the W, the M N H R B S, are distinguished in some measure by the ability of the eye to perceive differences in shape of masses of white on black, not of black on white; each of these letters resembling two or three others in general outline, and differing from its neighbors in the size and shape of the white areas which are let into it. These vary in size and shape, more than the black surfaces which have just been considered.

It would indeed be surprising if we should find in letters of the alphabet of uniform height any uniform standards for measuring visual acuteness; for such letters differ—

1st,—In the area of the rectangle in which they are constructed.

2d,—In the aggregate area of black in each letter.

3d,—In the relative areas of black and white contained in the rectangle of each letter.

4th,—In the manner in which black and white are massed together in the different parts of each rectangle.

There are at least two methods which suggest themselves

as likely to give us an improvement on the ordinary test alphabet. One, the purely experimental method, which has been followed above, of getting by actual trial the size of each letter which will render it distinguishable from its neighbor at a given distance. Another, of making each letter so large in proportion to the width of the lines which compose it, that all those places where one line approaches another may be cut out within a radius equal to the width of the line, without taking away anything from the general outline or shape of the letter. Thus:

The visibility of these letters is entirely dependent on the width of the lines which form them, and to an emmetropic eye they ought all to be seen at an equal distance. Perhaps as test letters they are no better than letters of ordinary shape reduced to the proper size by experiment.

It may be worth while to give them a trial; and the writer bespeaks the kindly attention of the Society to any cards which he may find it interesting to publish.

TWO CASES OF SUBCONJUNCTIVAL DISLOCATION OF THE LENS.

BY GEORGE C. HARLAN, M.D.,
PHILADELPHIA.

SOME years ago there was a patient under my care at the Wills' Hospital, with a subconjunctival dislocation of the lens, just above the margin of the cornea in its vertical meridian. The injury was the result of a blow with a fist from below, rupturing the sclerotic by contre-coup. The lens, which was of full size, was covered only by conjunctiva, but was fixed in its position. A segment of the iris was adherent as the point of rupture, enlarging and distorting the pupil, and there were some shreds of opacity, from hæmorrhage, in the vitreous, but the eye was quiet. As there was useful vision, it was thought best not to remove the lens, for fear that the rupture in the sclerotic beneath it might be open or imperfectly closed. There never seemed to be any reason to reverse this decision, though the patient remained under observation, by occasional attendance, for three years. There was no irritation and no change in the appearance of the tumor formed by the lens.

A middle-aged woman recently applied at the Hospital for treatment of an injury to the left eye, received, five weeks before, while she was engaged in chopping kindling wood. A piece of the wood struck the eye, which was wounded, as she supposed, by a broken nail which was found in the stick. Examination of the eye, however, showed that the injury had not been a laceration, but that the sclerotic had been ruptured by the force of the blow, and that the conjunctiva had not been torn. There was a curved bluish linear cicatrix about 5 m.m. from the outer margin of the cornea, and following its curve for a third of its circumference; and at the middle of this cicatrix a tumor, evidently formed by the lens, covered

only by conjunctiva. The pupil was contracted and completely occluded by iritis. The tension of the ball was reduced, and it was sensitive and irritable. I attempted to remove the lens entire, but there were firm adhesions of the capsule to the conjunctiva above and to the sclerotic and episcleral tissue below, which it was impossible to separate.

An incision of the capsule gave exit to an entirely clear lens. The wound in the sclerotic was completely closed by a flat cicatrix. Three days afterwards, there was a rapidly progressive staphyloma, of which there had been no indication before the removal of the lens.

The moral of these cases seems to be that, in the exceptional cases in which an eye remains useful after a subconjunctival luxation of the lens, it may be well to think twice before proceeding to removal.

DISCUSSION.

DR. MITTENDORF.—I would ask how soon after the accident did Dr. Harlan discover the lens? I have had cases in which on account of the inflammatory changes, the dislocation of the lens could not be discovered for four or five days.

DR. HARLAN.—I did not see the patient before the day of operation.

ECTROPION OF BOTH LIDS. BLEPHAROPLASTY BY THE ITALIAN METHOD.

BY R. H. DERBY, M.D.,
NEW YORK.

THOMAS CLARY, aged twenty-eight, wood chopper from Montana, received in infancy an extensive burn of the entire right side of the face. When seen, February 17, 1885, there was complete ectropion of the right upper lid. The ciliary margin of the lid was firmly adherent to the integument of the brow, and the growth of the eye lashes and eye brows was

intermingled and confused. The everted lid showed an hypertrophied fold of transmission. The lower lid was everted and fixedly adherent to the integument over the lower margin of the orbit. From constant exposure the eye was weak and subject to frequent inflammation. The skin adjacent to the eye and over a region extending over the right cheek, temple and lateral half of the brow, was transformed into a dense cicatricial tissue.

FIG. 1.

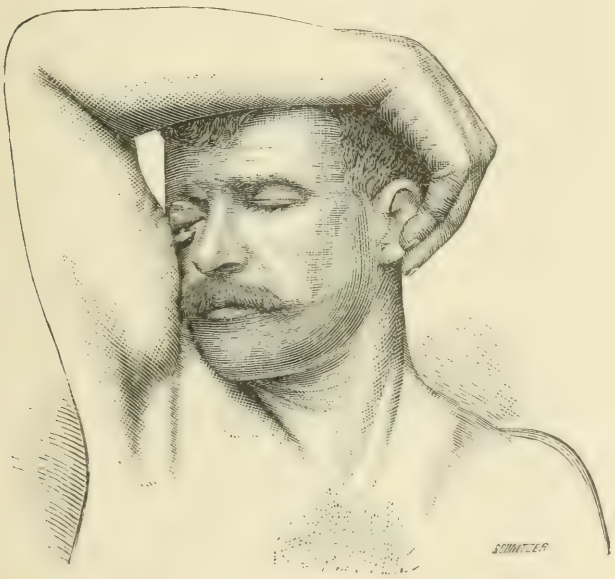
The condition of the adjacent skin precluded the possibility of a local transplantation of flap in any undertaking for the relief of the ectropion. Wolfe's operation seemed here to be out of place by reason of the devitalized integument which would surround the "transplanted" flap. The plan of making new lids from the skin of the upper arm was presented to the patient, and, with a view of testing his powers of endurance, his right arm was extended over his head, and in this position made fast by bandage and so left over night. The following day the patient expressed entire confidence in his ability to remain in this constrained position for a week, if

necessary, and under ether the following operation was undertaken.

February 23d.—An incision through the skin was carried from a point 3 m.m. outside of the outer canthus and parallel with the borders of the lids to a point opposite the two tear points. So far as possible the lashes were included in the thus liberated upper lid. The margins of the lids were scored with the knife and then brought together with sutures.

A flap 6 c.m. long, by 4 c.m. wide, with a pedicle, was dissected from the right arm over the inner and anterior biceps region. This flap was bisected in a portion of its length,

FIG. 2.



leaving two-thirds for the new upper and one-third for the new lower lid, was placed in position on the lids and secured by sutures. The arm was bent over the head and secured in place by a firm water-glass bandage. This consisted of, 1st, a piece of cloth completely enclosing the arm from the axilla to the elbow and the side of the head and face, so as to firmly hold the arm in place; 2nd, two layers of iodoform gauze;

3rd, a thick layer of absorbent cotton; 4th, a roll of flannel bandage; and 5th, several rolls of bandage, which had been soaked in water-glass, so that on becoming dry, a firm, hard dressing remained. The wound of the arm was quite extensive, and was brought together as far as possible by sutures and pins.

February 26th.—The arm has not been allowed to be removed from the head since the operation, remaining firmly in position, held by the water-glass dressing. This was removed to-day and a simple flannel roller applied over cotton and iodoform gauze.

February 28th.—Dressings removed; flaps present a healthy appearance, except at the very inner part on the upper flap, where there is a small space of discolored tissue. The flaps seem well united. To-day a vertical incision was made through the flap at the outer side of the outer canthus, liberating the arm from the head. This left a part of the flap at the outer end which rested on the undenuded skin. The most of the sutures were removed, and a compress and bandage were applied to the eye after a thorough cleansing with boracic acid solution. The wound of the arm is in a good healing condition. This was dressed with iodoform powder and bandage, and the arm brought into the natural position.

March 4th.—The flaps show much less prominence than at the last date, and have a very healthy appearance. At the extreme inner part of the upper flap, which was discolored, there is only a superficial destruction of tissue. No power of sensation is yet established in the flaps. A firm pressure bandage has been applied daily, which seems to reduce the prominence produced by the flaps. Twice daily the parts have been bathed for an hour at a time with hot water, and boracic acid powder then dusted on.

March 8th.—Continued improvement in the condition of the parts. Since the operation there has been no inflammatory reaction. Under the use of the pressure bandage there has been a gradual diminution in the prominence formed by the flaps. There is only a slight discharge. Firm union is estab-

lished through the entire extent of both lids. At the outer part, where the flap rests on the undenuded skin, there is of course no union. The same treatment as before has been followed. Some slight power of sensation is established.

March 21st.—Since the last date the progress of the case has been favorable. To-day the patient was etherized and an operation performed to divide the graft and relieve it of some of the superabundant tissue at the outer side. A horizontal incision was made dividing the flap into two parts, an upper and a lower; then the outer part of each of these was cut off by vertical incisions, about on a line with the outer canthus. Each flap was then undermined and denuded for a short distance, and each trimmed, and then firm union produced by sutures. The original lids were then placed in position by making a slight incision parallel with the ciliary margins and about 2 m.m. anterior, and sutures inserted so as to bring the free margins into proper position.

The wound on the arm has healed very rapidly, partly by granulation.

March 23d.—Bandage was removed this morning and parts found in good condition. The outer canthus has been very much relieved by the last operation.

March 24th.—Flaps are in good condition; there is rapid healing. Patient is now able to open lids quite wide. Sutures removed to-day; warm water bathing each day, and parts simply protected with isinglass plaster.

March 27th.—The parts have settled down very much since last date. There is no inflammation, and no treatment employed except keeping the parts clean.

May 5th.—Canthoplasty.

May 9th.—Previous transplantation of skin causing tendency to entropion, was thinned down and replaced with sutures.

May 13th.—Previously transplanted flap dissected from its superior attachment, and deprived of its superabundant adipose and cellular tissue, and replaced with sutures.

July 6th.—Cicatricial bands at the outer canthus were divided subcutaneously.

The appearance of patient on July 23d, nearly five months after the operation, is well shown in wood cut, No. 3. He

FIG. 3.

can completely close the eye, and he is free from frequently recurring inflammation from which he formerly suffered.

DISCUSSION.

DR. HOWE.—What was the nature of the cicatrix that rendered this operation necessary?

DR. R. H. DERBY.—The cicatrix extended to the median line. It was dense and firm, almost cartilaginous.

DR. HOWE.—I asked in regard to the nature of the cicatrix, because four years ago I reported a case in which there was a similar injury. I had an apparatus to keep the arm in position, but it was unsatisfactory. I think at that time it was the very largest flap that had been reported. The flap was so large that for a time it was impossible to open the eye. This contracted somewhat, and I have since learned that it has contracted still more. Although the patient can now close the eye, it is with some difficulty. We should reserve our judgment until we see that all retraction has taken place.

DR. FRYER. I would ask Dr. Derby if there has been

much retraction since the operation? I reported at the last meeting an operation according to the Wolfe method. The operation was done eighteen months ago, but there has been little or no retraction.

DR. R. H. DERBY.—The patient has been under almost constant observation. For the past two months there has been no retraction, and no sign of a return to the original condition. There has been a great deal of flattening of the flap.

DR. FRYER.—I believe that frequently we do not have the retraction that is reported.

DR. MITTENDORF.—I have listened to this paper with much interest, and I think that it will turn out better than where Wolfe's method is employed. The flap showed more vitality than the flaps usually do in the Wolfe method. Even after the pedicle had been separated, the healthy appearance of the flap was very striking.

LUXATION OF LENS BENEATH TENON'S CAPSULE.

BY O. F. WADSWORTH, M.D.,
BOSTON.

As I do not remember to have seen any report of the luxation of a lens beneath Tenon's capsule, it seems worth while to put the following case on record:

James T., aged forty-seven, entered the City Hospital March 18, 1881, by advice of his family physician, for enucleation of his left eye. Two weeks before, he had received a blow on this eye from the horn of a cow, which had destroyed its sight. Since the injury the eye had been painful, and any attempt to use the other eye had caused pain in it also.

The cornea was slightly hazy; a narrow strip of iris was visible at the inner and lower edge of the anterior chamber, elsewhere the area behind the cornea was dark and partly filled with blood. Near the inner edge of the cornea was an irregular cicatrix in the conjunctiva, and a few dark irregular lines in the tissues beneath suggested a partial rupture of the

sclera. Upward and outward, between the external and superior recti, beginning $1\frac{1}{2}'''$ to $2'''$ from the edge of the cornea, was a rounded swelling, of the size and shape of the crystalline lens. Oblique light showed the swelling to be translucent. It was evidently covered by a layer of dense tissue.

I supposed the lens lay between the sclera and Tenon's capsule, and that on division of the capsule, during enucleation, it would escape; but this proved not to be the case. In the operation the hook glided behind the swelling, and it remained in position when the globe was removed. The eye was hardened in Müller's fluid and alcohol, and later divided antero-posteriorly through the centre of the swelling.

Macroscopically, no sign of a rupture in the sclera could be seen. The lens appeared to lie against its outer surface; or rather it seemed as if the greater portion of the sclera lay between the lens and the vitreous chamber, while a thin layer of its outermost fibres passed outside the lens and held it in place.

On thin sections through the whole globe, which Dr. H. P. Quincy kindly made for me, the microscope showed, however, the true condition. The sclera had been ruptured near the anterior edge of the ciliary body, and the wound had been completely closed by cicatricial tissue. The whole thickness of the sclera ran along on the inner side of the lens, and the fibrous layer on the outer side of the lens was the capsule of Tenon, which curved round the lens behind, and was there united firmly to the sclera by inflammatory exudation.

CLINICAL OBSERVATIONS.

By L. WEBSTER FOX, M.D.,
PHILADELPHIA.

Obs. I.—Congenital cataracts successfully removed in a patient sixty years of age.

On February 4, 1884, Harriet H——, negress, presented herself at the Eye Clinic of the Germantown Hospital, suffering with cataracts. The lenses were opaque, with well-marked deposits of calcareous concretions situated in the anterior or visible portions of the lenses.

Upon examination, good projection of light obtained. The history elicited was that since birth the vision had not changed, she simply being able to distinguish day from night, or the light of a lamp, or the shadow of a dark object when brought directly in front of her face.

Feeling assured of the sensibility of the retina, an operation for cataract in one eye was suggested, and was performed. The lens was successfully removed in its capsule with a Critchett's spoon. There was a small loss of vitreous, which was fluid. The eye was closed immediately, and the wound healed without reaction; the eye was bathed daily with a mild astringent lotion, but the eyelid was not disturbed. At the end of eight days the bandages were removed, when it was found that the wound was closed and a key-hole iridectomy existed, which was perfect in outline and showed clear media. The patient was astonished; she could see objects several feet distant, but was quite at a loss to understand the visual phenomena. She was quite nervous from the effect of the shock, and started violently and closed her eyes as if with fear. She was unable to name any object placed before her, but readily distinguished it when her hand was placed upon it. A few moments afterward she readily distinguished a watch

which was shown her. This was distinguished not by its form, but by its ticking.

At this time, wools of different colors were placed before her, and a certain one given to be matched, which was done without confusion, proving the accurate sensibility of the retina to the most delicate tints, although not a name was known to the patient. After several days the object and wool tests were again made with the same results.

When looking at a distance—for she could recognize objects at a distance, the refraction of the eye before the operation being myopic to eleven dioptrics—she tried to grasp the objects, and a flock of sparrows were supposed to be tea-cups.

Owing to her first impression of distances she was for quite a time afraid to walk with her eyes open, the floor appearing at a great distance; a red and black color producing pain in the eyeball, while green and white were soothing. After the bandages were removed from her eyes, she was allowed the freedom of a moderately lighted room to become accustomed to the objects about her, as well as to learn to measure distances; she repeatedly refused to walk, although the nurse assured her that no danger would befall her in the effort.

The patient was soon able to associate the name with the object, and at the end of some weeks, in the meantime using her eye constantly, she was able to mention all the objects in the ward of the hospital, but at times would make mistakes quite as ludicrous as confounding the birds with the tea-cups. Her vision without glasses is equivalent to $\frac{20}{200}$, and with sph. + 1. she is able to see fine stitches, which would be equal to J. 1 at 10″.

In January, 1885, the right eye was operated on; no reaction followed, and she is now able to see perfectly with both eyes. Her color fields were accurately measured at different times, and found to correspond to Landolt's measurements.

The fundus oculi presents a peculiar picture. The optic nerves are oval in shape—not due to astigmatism—while the vessels are few in number, and do not extend beyond the equator bulbi, and merge into capillaries. The lenses were found to be only two-thirds the size of an ordinary adult lens.

Instead of being convex in shape, they were found to be spheroidal. The patient is now employed as a general servant in the hospital.

Obs. II.—R. L., a woman of twenty-seven years. At three years of age was injured in the left eye; two years subsequently sympathetic ophthalmia developed, leaving the right eye with qualitative perception of light only. At various times she had operations performed on right eye by distinguished surgeons, with negative results.

On June 21, 1884, at the Germantown Hospital, an iridotomy was performed on the right eye; a large ovoidal-shaped pupil with clear media was the result of this operation.

This patient, who had had good vision at one time, was annoyed at the "confused look" of surrounding objects. Erythropsia was also annoying. After three months this retinal irritation disappeared and objects assumed a natural color. Colored glasses were worn for this defect.

After repeated examination the following formula was prescribed: sph. + 10. D. ⌒ cyl. + 3. D., axis 180° ⌒ cyl. + 2. D., axis 50°; $V = \frac{20}{20}$.[1] For reading, sph. + 14. D. ⌒ cyl. + 1.50. D., axis 50°, J. 1 at 10″.

The patient (educated at a blind asylum) has presented me, in writing, with her first mental impressions, after the restoration of vision, of the living and inanimate objects surrounding her; and her mental conception of objects conveyed through the medium of touch, was as unlike that received through the now restored organ of vision as day from night.

DISCUSSION.

Dr. Dennett.—I understand that two cylinders were used in this case. I am not mathematician enough to say why, but I think that two cylinders, with their axes inclined to each other, might be replaced by one cylinder.

Dr. Knapp.—That is so.

Dr. Risley.—I recall one instance in which, with a spherocylindrical lens, I was able to improve vision by adding a prism

[1] Formula ground in one glass by Borsch, 1324 Walnut St., Philadelphia, Pa.

with the base downwards. I think that the improvement was due to the bending of the light toward the macula.

DR. ROOSA.—I want to express my interest in this first case. I had one case, that of a boy, fourteen years old, who passed through some of these stages, but not in such a marked manner as detailed by Dr. Fox.

There is one point that I wish to call the attention of the Society to. I have heard some of the members to-day express vision by a number of words which are unnecessary. One said, $\frac{20}{30}$ "barely," and Dr. Fox said, "nearly" $\frac{20}{20}$. I think that if a patient can see all the letters of $\frac{20}{30}$ and a few of the letters of $\frac{20}{20}$, we should say V. $= \frac{20}{30} +$. If he can see all of $\frac{20}{30}$ and more than half of $\frac{20}{20}$, we can say V. $= \frac{20}{20}$.

DR. FOX.—I use that method in my case-book.

DR. DENNETT.—I was in the habit of indicating this same thing with crescendo and diminuendo signs, as in algebra, at one time, but I grew out of the habit of doing this because it was not always understood.

DR. KNAPP.—I think that the method of Dr. Roosa should be adopted. It is short and perfectly scientific.

A CASE IN WHICH THE ENUCLEATION OF AN EYE FOR GLAUCOMA ABSOLUTUM WAS FOLLOWED WITHIN THIRTY-SIX HOURS BY AN ATTACK OF ACUTE GLAUCOMA IN THE FELLOW EYE.

BY DAVID WEBSTER, M.D.,
NEW YORK.

THOMAS B., aged fifty-four, a native of England and a cutter by occupation, came to me at the suggestion of my friend, Dr. Thomas H. Holgate, of New York, on September 23, 1884. He recollected that, upon more than one occasion, in early life, he had received blows, more or less severe, upon his right eye. He was not aware of any impairment of vision, however, until the year 1874, during which he lost the sight of his right eye from successive attacks of what appears, from the history, to have been inflammatory glaucoma. From that time the eye has been sightless and frequently bloodshot and painful.

The left eye had never given him any trouble until within the last few months. Within that period it had been the subject of more or less frequent attacks of cloudiness of vision, but always without pain. A week before he came to see me he had attended a "Society meeting" at Coney Island, had eaten, drank and smoked excessively, and had been greatly alarmed by a consequent obscuration of vision, so extreme that during the evening he "could not discern objects at all." He awoke the next morning, however, with the sight fully restored, and, since that time, had used neither tobacco nor spirits.

Upon examination I found:

Right Eye, pupil dilated and fixed, and giving a greenish reflex, anterior chamber shallow, emergent ciliary vessels enlarged and tortuous, entire ciliary region of a darkish hue as from thinning of the sclera, so much opacity of the dioptric media as to prevent a view of the fundus and the tension much increased (+ 3). There was also a moderate amount of divergent squint.

Left Eye, vision = $\frac{20}{15}$, H. m. $\frac{1}{42}$, some central depression of a slightly hyperæmic optic disk, pupil small and quick, tension normal, no limitation of visual field.

As there was, as yet, no permanent impairment of the vision of the left eye, I decided to keep the patient under observation and see how corrected personal habits would influence his eye trouble. I told him to live temperately and come to see me again in a week.

He returned on September 23d. Meanwhile, he had experienced two attacks, in the two weeks, similar to that which he had on Coney Island. The last and worst of all he attributed to his having eaten a peach, which caused indigestion. It began at 5.30 P.M., and had not abated when he was put to bed. As before, when he awoke in the morning it was gone, and he saw as well as ever. Upon consultation with Dr. C. R. Agnew, it was now decided that it would be best to remove the useless and mischievous right eye. Accordingly, with the assistance of Dr. Holgate and Dr. Frank W. Ring, I placed the patient under ether and enucleated the eye on September 29th. For thirty-six hours after the operation the patient got along as

well as could be expected, but when I visited him on the second morning, the morning of October 1st, I found him suffering from an attack of acute glaucoma in his remaining eye. His wife informed me that he had been "vomiting and crazy with pain all night." He was still able to count fingers at five feet. His eyelids were slightly swollen and suffused with tears, his eyeball was red and slightly chemotic, his pupil dilated and fixed, his anterior chamber shallow, and the tension of his eyeball greatly increased.

As I was unprepared to operate, I placed the patient upon the use of eserine, one per cent. solution, every two hours, and iced cloths constantly. In the afternoon, at 4 o'clock, I found that there had been no further deterioration of vision, and that the pain, though not entirely relieved, was much less. Dr. Ring again administered ether, and I performed an iridectomy upwards.

October 2d. No pain since operation; sight much better; no lachrymation; swelling of the lids and of conjunctiva unimproved.

October 4th. Tells time of day on watch; no pain. Dropped in a drop of a solution of sulphate of atropia, four grains to the ounce, to prevent adhesions.

October 5th. Had slight pain last night for a few hours. Lids still somewhat swollen and eyeball quite red. Anterior chamber beginning to be re-established.

October 14th. Comes to the office wearing an artificial eye. Vision $= \frac{20}{30}$; eyeball still a little red.

October 18th. Vision $\frac{20}{20}$; to go to work.

November 17th. Vision continues $\frac{20}{20}$; eye looking well, and patient pursuing his occupation without difficulty.

The enucleated eyeball was examined by Dr. E. M. Culver, of New York, who kindly furnished me with the following statement:

"I find some cupping of the optic papilla; not enough, however, I think, to make a positive diagnosis. The lens shows a disarrangement of some of the posterior layers of fibres, and must have been opaque, to some extent, before treated with fluids for hardening. The retina seems everywhere to be

separated from the choroid (perhaps by contraction of the celloidin in which it was embedded), and shows, at various intervals, large vessels in an advanced stage of atheroma with very great thickening. These vessels must have been very plainly seen on examination if the lens permitted a view of the interior of the eye.

"Certainly the diagnosis of glaucoma absolutum is established, with, perhaps, the addition of some nephritic trouble?"

In the *Medical News*, Vol. XI., No. 8, I published nine cases, most of them operated upon by Dr. C. R. Agnew, in which an iridectomy on one eye seemed to precipitate an attack of acute glaucoma in the other eye. Many other ophthalmic surgeons have observed similar cases, before and since. But the above case is the only one that has fallen under my observation in which an *enucleation* has produced the same unpleasant result. I believe it to be the first case of the kind ever reported. One of my ophthalmic friends suggested to me that it was a *coincidence*, and that it would have happened at that time, just the same, if the other eye had not been touched. I am inclined to think, however, that this was not the case. It was so similar to so many cases I have seen, in which acute glaucoma in one eye followed iridectomy in the other, that I am persuaded that the attack was *precipitated*, or brought about before its time by the enucleation. I suppose a sufficiently extensive experience will show us that *any operative interference with one eye of an etherized patient may excite acute glaucoma in the other, provided always that it be strongly predisposed to that disease.*

DISCUSSION.

Dr. Risley.—The early history of this case, prior to enucleation, calls to mind a case of a lady for whom I did an iridectomy in a blind eye for sub-acute glaucoma to relieve the pain. This resulted in entire relief. A few years later, she returned, much alarmed over recurring attacks of obscuration of vision in the good eye, associated with tenderness of the ball, and halo around the gas light. Finally she observed that eating certain acid fruits would surely bring on these attacks, grapes and peaches being especially apt to do so. By avoiding these acid fruits, she escaped.

THE ELECTRIC LIGHT OPHTHALMOSCOPE.

BY W. S. DENNETT, M.D.,
NEW YORK.

ELECTRICITY as an illuminating agent for ophthalmoscopic examination is likely at some time to come into general use. The difficulty of managing such light is not great, and certain advantages are obvious to any one who has made experiments with it.

We all know that the necessity of coördinating many motions of both patient and observer is the great difficulty in the way of the student who would learn rapidly to make ophthalmoscopic examinations, and in many cases where the examination is at all difficult to an expert, it becomes a simple matter if the light is made a part of the instrument itself, and so a constant instead of an ever vanishing factor.

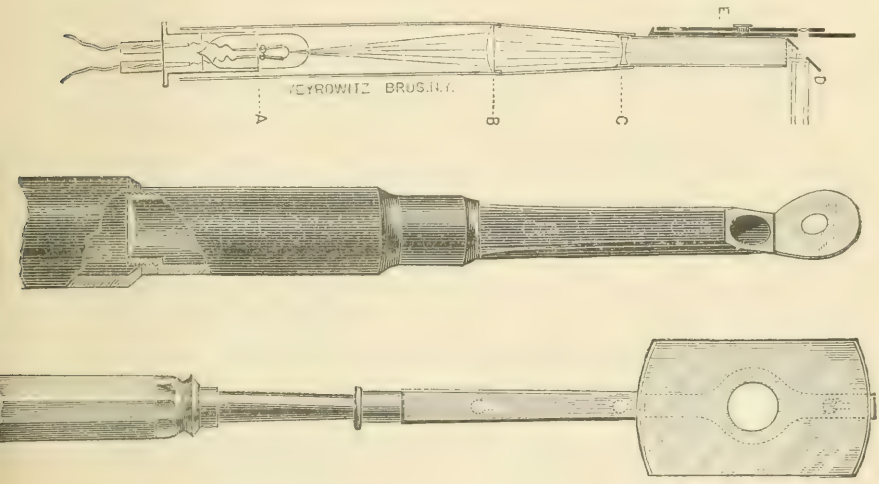
This result has been obtained by placing in the handle of the ophthalmoscope a small incandescent lamp of about three quarters candle power. The instrument here exhibited is like the ordinary "Loring," except that the handle is a trifle larger round and hollow, as explained by the cut, which is one half actual size.

The concave lens at C is found to be unnecessary, and the lamp A is placed in the focus of the condensing lens B and can be moved either to or from the lens, so that it throws upon the small mirror D, either a parallel, convergent or divergent pencil, thus varying both the intensity of the illumination and the size of the field.

Those who have experimented with the so-called retinoscopy as a test for H., M., As., and the like, will appreciate this advantage, as the character of the pencil can be changed without altering the distance from the patient or determining the relative places of the conjugate foci of the mirror, which in this instrument is a plane glass.

Electricity is supplied from a pocket battery, or from any of the various batteries now in use for such purposes, and which can be bought or rented from the makers of the instrument, Messrs. Meyrowitz Bros., opticians, 295 and 297 Fourth Avenue, New York.

The above firm have just completed an instrument exactly like the most approved Loring ophthalmoscope, except that the handle and mirror may be removed in one piece and the electric light handle attached in its place.



DISCUSSION.

THE PRESIDENT.—What effect has the light on the color of blood?

DR. DENNETT.—I supposed that the colors would come out as they do in sun-light. This was not so noticeable. I have never thought that there was any very noticeable difference in the illumination with this light and that from the argand burner. I think that this is a little whiter light.

DR. MITTENDORF.—Such an ophthalmoscope is of great service in the wards of a hospital, or in ophthalmoscopic examination at the bedside, as it avoids the necessity for carrying a lamp around.

ON THE RELATION BETWEEN THE EARLIER STAGES OF GRAY DEGENERATION OF THE OPTIC NERVES, AND THE INCREASE OR DIMINUTION OF THE PATELLAR-TENDON REFLEX (KNEE JERK).

BY WILLIAM F. NORRIS, M.D.,
PHILADELPHIA.

IT has long been known that gray degeneration of the optic nerves is at times a forerunner and herald of similar lesions in the spinal cord, and that it may thus become an important additional symptom to aid us in the diagnosis of that many-sided malady, tabes dorsalis. The interval between the development of the eye and the spinal symptoms is often considerable, and at times very great. Förster gives a case where complete optic atrophy preceded the development of all other symptoms by a period of three years, and he has seen a number of other instances where atrophy preceded the other symptoms for a less period. Charcot records another case where the interval was ten years. Gowers relates two interesting cases, in one of which blindness preceded the development of other symptoms for a period of fifteen years, while in the second the interval was twenty years. Buzzard also has recorded an observation where blindness and lightning pains manifested themselves fifteen years before the development of the ataxic symptoms. Since Westphal has given us in the loss of the knee jerk another early symptom of tabes, the proportion of cases, in which gray degeneration of the optic nerves is demonstrable before ataxic symptoms are developed, seems still greater. Of late years the conviction has been growing on the part of both eye surgeons and of nerve specialists that a very large proportion of the cases of essential atrophy of the optic nerves are forerunners of tabes dorsalis. Of course,

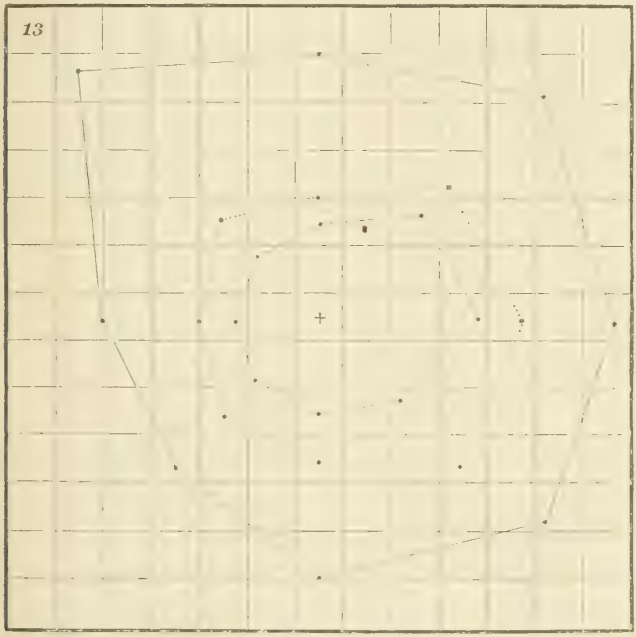
studies at an eye clinic give an exaggerated view of the frequency of this class of cases, inasmuch as they alone resort to it. Leber records twenty-six per cent. of the atrophy cases at his clinic as tabetic, while Gowers gives twenty per cent. as the relation between optic nerve degeneration and tabes, and thinks that it really should be stated as fifteen per cent., because five per cent. is due to his colleagues sending him cases for examination. Nettleship classifies seventy-six cases of optic atrophy as follows, viz.: thirty-eight as presenting undoubted symptoms of locomotor ataxia, eleven as presenting mixed spinal and cerebral symptoms (as in general paralysis of the insane), nine with other forms of spinal degeneration (without brain lesions), three cases associated with reflex iridoplegia without other symptoms of spinal or cerebral disease, and fifteen cases only in which there was no manifest disorder of other parts of the nervous system.

It is to the earlier stages of this gray degeneration of the optic nerves to which the writer would here call attention, to that stage where the nerve is simply sickly and has not yet become atrophic, where there is almost full acuity of central vision, with slight contraction of the field for form and color; and where the pupils are still prompt, both in their reaction to light and to accommodation. Such sickly nerves have received much discredit from the rough and usually incorrect descriptions of the early days of ophthalmoscopy, where the finer details of the eye ground have been lost in the flood of light and the small magnifying power incident to the indirect method of examination, and where the optic discs have been described as white, pink, or a little too red. Even to the thoughtful observer availing himself of every advantage of the upright image and weak light, it is often impossible to differentiate at first sight the slight cloudiness and discoloration of the early stages of degeneration, from the œdema and cloudiness of the low grades of intra-ocular neuritis, caused by eye strain and the holding of ametropic eyes continuously to near work, from the red gray nerves of the early stages of neuritis due to intracranial disease, or from the congestion of the optic entrance due to uterine, or ovarian disease. No one, I think, can always

at first diagnosticate such cases with certainty; but in the irritation due to eye strain must wait to see whether rest and atropia will not cause the cloudiness to pass off; and in those cases due to the other causes above mentioned, must wait for the development of other and more characteristic symptoms either in the general health or in the eye ground itself. Again, we may have cloudy pallor of the discs from hæmorrhage, profound anæmia or dyscrasic states of the blood, which should also be excluded by appropriate tests. In fact, just as the presence of optic neuritis fails to indicate to us its cause, and is, so to speak, merely a danger signal, which makes the careful clinician pause to find by the investigation of other symptoms whether it indicates eye strain, meningitis, brain tumor, Bright's disease, or some affection of the orbital optic nerve; so here we have a sign of nerve disturbance which should lead us to look out for tabes dorsalis or other degenerative processes of the cerebro-spinal system.

The writer is well aware that eye symptoms, either from degeneration of the optic nerves, or from the impaired action of the external or internal eye muscles, may be absent in tabes, and that eye symptoms are associations rather than effects of the spinal disease; these associations being of very common occurrence. He would not either in any way create the impression that he considers that all such cases invariably go on to tabes dorsalis; but they are true danger signals which should teach us to insist on rest for the brains and spinal cords of our patients, and the use of alteratives and tonics. In the earliest stages of degeneration the discs are usually of a dull red gray tint. Careful focussing shows, however, that they are only capillary superficially, and that the deeper layers in the neighborhood of the lamina cribrosa are decidedly gray and wanting in blood circulation. There is often sufficient haze of the retinal fibres to veil and at times to hide the scleral ring. The above condition is followed later by a pallid, "filled in" appearance of the nerve, which is more or less woolly superficially, being surrounded upon all sides by a broad and often sharply cut scleral ring. The larger retinal arteries and veins do not at this stage present any appreciable change

in their calibre or appearance. The views stated by the writer in this paper are the outgrowth of many years of careful clinical study, but the statistical statements which follow are based upon the last forty-seven cases of gray degeneration of the optic nerves which presented themselves at his service in Wills' Eye Hospital. They have been taken just as they came, the only principle of selection having been to reject all those where there was any suspicion of intra-cranial or intra-ocular disease, and to use only those cases in which the acuity and field of vision, the pupillary reactions, and knee jerks have been carefully and repeatedly tested. These cases show that there was always a slight but readily appreciable contraction of the fields for form and color, while the acuity of vision (after the correction of any error of refraction) was



EXPLANATION OF FIGURE 13.

THIS represents a field of a right eye which has been assumed as normal. It has been inserted so as to serve as a ready comparison with the following fields, upon account of its having been taken by the use of the same instruments and in the same positions.

about normal, and that the pupillary reactions were also prompt. There was often an increase, more rarely a diminution of the knee jerk. The extent and rapidity of the jerk often varied considerably on the two sides, and in many cases the increased jerk corresponded with the larger field of vision. They also show that in the earlier stages we can diagnosticate different degrees of degeneration in the optic nerves before the pupils become affected, and that later in the disease, when the pupils become abnormal, the most defective pupillary action usually corresponds with the most degenerated nerve. Of the whole number tested the knee jerk was normal in six cases, increased in eighteen, diminished in ten, and abolished in three. Increase of the patellar-tendon reflex is held by most writers to indicate sclerosis of the lateral columns of the cord; but while this is undoubtedly the case in many instances of advanced spinal disease, its very great frequency in the early stages would seem to indicate that the possibility indicated by Bramwell here exists, and that it is really due simply to irritation of the gray matter of the cord. A consideration of these cases shows that here, as in tabes, there is a great preponderance of male patients. When we classify them as to age, we find that none were under ten years of age, that there were six only between twenty and thirty, thirteen between thirty and forty, seventeen between forty and fifty, nine between fifty and sixty, and but two between sixty and seventy.

As the degeneration of the nerves advances and as the pupillary symptoms develope, the knee jerk is diminished or entirely lost. The pupillary symptoms may be either reflex iridoplegia or reflex cycloplegia, or both may be combined.

The following tables are herewith appended, that the reader may more readily see at a glance the bearing of the facts above recorded. The writer is aware that the number of cases is small, and regards the tables only as preliminary to more complete statistics which he is now engaged in preparing, and which he hopes to publish at a later day.

EXPLANATION OF PLATE.

THERE are twelve fields on this plate. Each field has been reduced to one twelfth of its original size. They were all obtained by the carrying inwards on a large ruled black-board, of a centimetre square of unglazed white or colored paper on a dead-black card; the patient being placed at about twenty-five centimetres distance from the fixation point, which consisted of a small white cross. The outer ruled lines represent the furthermost boundaries of the white fields; the dotted lines bound the blue areas; the inner stroked lines designate the outer boundaries of the red fields.

Figures 1 and 2 represent the largest fields, with diminished knee jerks. These are fields of the right and left eyes respectively of T. D., aged forty-four years. Optic nerves red-gray in tint, with scleral rings visible all around and too broad. R. E., V. $= \frac{6}{6}$. L. E., V. $= \frac{6}{7}$. Irides mobile to light and accommodation. Paresis of left internal rectus muscle. Knee jerks diminished, more so on the left side. Twenty-two months after the first examination, optic nerves had become grayer with slight saucer-like excavations to the temporal sides. Left pupil had become dilated and the iris immobile, whilst the knee reflexes had still further diminished.

Figures 3 and 4 represent the smallest fields with exaggerated knee jerks. These are the right and left fields of the eyes of a female, C. R., aged thirty years, who had hypermetropic eyes, which with proper correction had nearly full acuity of vision and normal accommodation. Both optic nerves gray, the left the grayer. Scleral rings all around, broader out. Central physiological excavations. Irides prompt, knee jerks exaggerated, the left more so.

Figures 5 and 6 represent great contractions of color-fields without marked shrinkage of form fields (knee jerks exaggerated). These are the right and the left fields of the eyes of J. S., a female aged sixty-five years. Decided incipient atrophy of both optic nerves. Scleral ring all around, broader out. O. U. (separately), V. $= \frac{6}{18}$ with uncorrected hypermetropia of one dioptric. Irides prompt. Knee jerks exaggerated.

Figures 7 and 8 represent unequal fields, the greater field coinciding with the greater "patellar-tendon" reflex. These are the right and the left fields of the eyes of F. S., a female aged fifty-six years. Optic nerve red-gray, the left not so much so. Scleral rings all around. O.², V. $= \frac{9}{6}$ separately. A. normal for age. Irides prompt. Both "patellar-tendon" reflexes exaggerated, more so on the left side.

Figures 9 and 10 represent contraction of form and color-fields, with unequally diminished patellar-tendon reflexes. These are the right and the left fields of the eyes of P. A. G., a male aged thirty-seven years. R. E., V. $= \frac{6}{6}$? L. E., V. $= \frac{6}{9}$. Hypermetropia; but with this corrected, accommodation much below standard for time of life. Both pupils irregular (not from synechia). O. D. pupil the larger. Irides prompt, knee jerks greatly diminished on right side, less so on left.

Figures 11 and 12 represent contracted fields with abolished patellar-tendon reflexes. These are the right and left fields of the eyes of A. W., a male aged fifty-three years, with marked atrophy of each disc and decided diminution in the calibre of the retinal arteries and veins. R. E., V. $= \frac{2}{60}$. L. E., V. $= \frac{1}{60}$. Left pupil smaller than the right. Knee jerks absent on both sides.

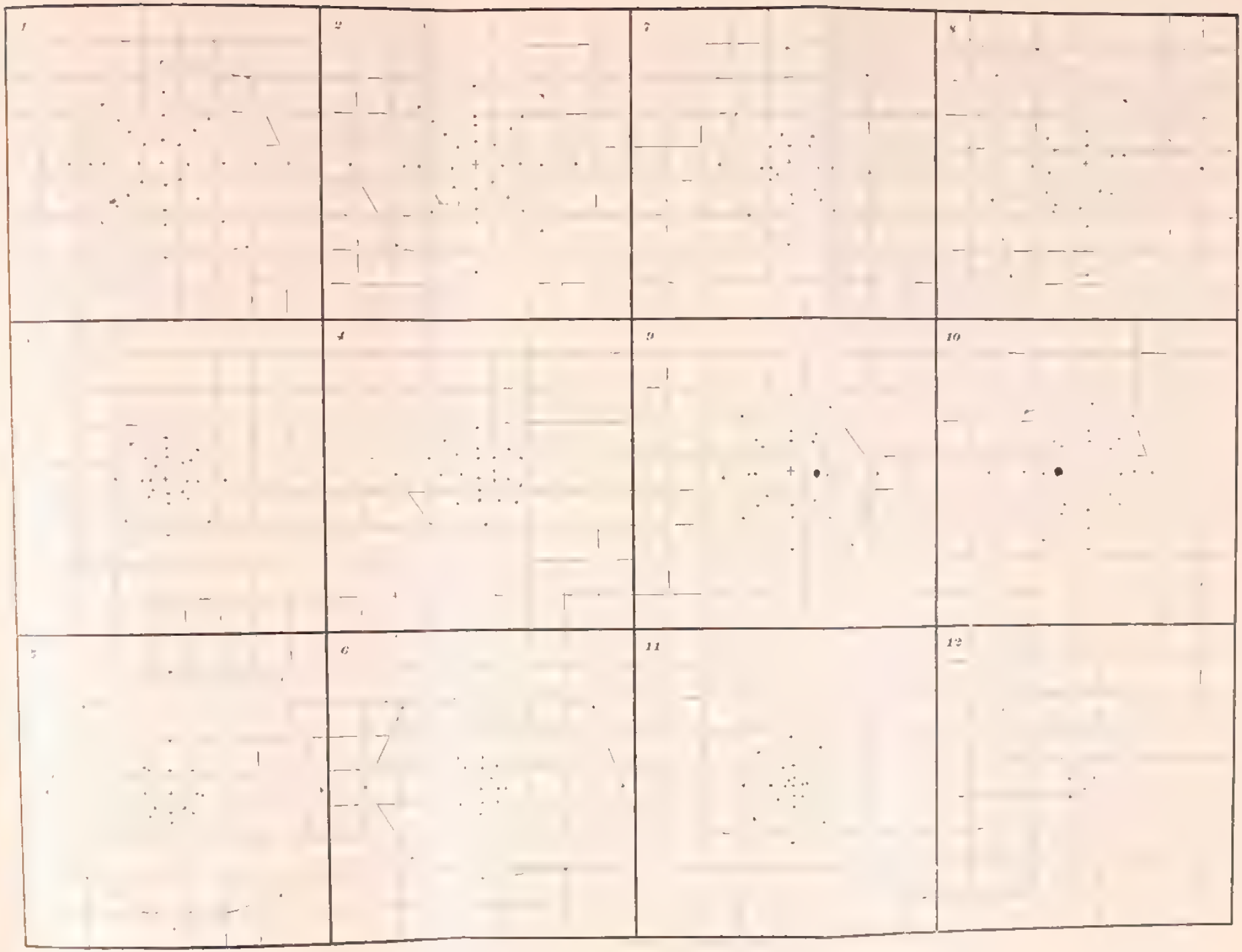

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TABLE I.—Showing the character of "Patellar-Tendon" Reflexes in relation to the comparative sizes of fields of vision.

CHARACTER OF "PATELLAR-TENDON" REFLEX.	Comparative size of fields.			Total Reflexes.
	Equal.	Right the greater.	Left the greater.	
Both equally increased	1	8	6	15
Right the more increased		3	2	5
Left the more increased	1	2	5	8
Right increased, left normal		2	1	3
Right increased, left diminished				
Left increased, right normal	1			1
Left increased, right diminished				
Both equally diminished	1	3	2	6
Right the more diminished	1	1		2
Left the more diminished	1	1		2
Right diminished, left normal				
Right diminished, left increased				
Left diminished, right normal	1		1	2
Left diminished, right increased				
Both abolished		1	2	3
Left abolished				
Right abolished				
Total Fields,	7	21	19	47

TABLE II.—Showing ratio of sex.

SEX.	NUMBER OF CASES.
Male . . .	28
Female . . .	19
Total,	47

TABLE III.—Showing average age of cases.

DECADES.	AGES (IN YEARS).	NUMBER OF CASES.
1	10—20	0
2	20—30	6
3	30—40	13
4	40—50	17
5	50—60	9
6	60—70	2
Total Number of Cases,		47

TABLE IV.—Showing the condition of Pupils and Irides in relation to the amount of Degeneration of Nerves.

AMOUNT OF DEGENERATION OF NERVE.	Condition of Pupils and Irides.					Total Nerves.
	Both Normal.	Both Abnormal.	Right Abnormal.	Left Abnormal.	Not Noted.	
Equally degenerated	6	2	2	1	8	22
Right Nerve more degenerate	6		1		1	8
Left Nerve more degenerate	7			3	7	17
Total Pupils and Irides	22	2	3	4	16	47

It will be interesting to study, in the condensed histories of the three cases of nerve degeneration which follow, the gradual progress of the disease, and the relation of the eye symptoms to those indicating deterioration of the spinal cord.

Case I.—J. C., a clergyman aged forty-four, has had severe pain in both eyeballs at intervals for the last sixteen years. R. E., V. = $\frac{20}{30}$, L. E., V. = $\frac{20}{40}$. Fields not taken and knee jerks not tested. The ophthalmoscope shows grayish red œdematous discs, which cleared up to a considerable extent under the influence of rest and atropia, only to show marked gray pallor of the deeper layers of the head of the nerve and a scleral ring which was too broad and which could be followed all round the disc. There was hypermetropic astigmatism of both eyes, amounting in the right to $\frac{1}{4}\frac{1}{8}$, and in the left to $\frac{1}{4}\frac{1}{2}$, but after correction vision remained $\frac{20}{30}$ in the right and rose only to $\frac{20}{30}$ in the left. He had also a presbyopia of $\frac{1}{36}$ and an insufficiency of the interni amounting to 14°. Prisms with sphero-cylindroid correction were a great relief, and enabled him to do his work much more comfortably. Seven years later I had a letter from him from Wyoming Territory, saying that he had again had trouble in the use of his eyes, and that a cloud (central scotoma) had suddenly come before them. Later in the same year I saw him, with a shambling gait, his knee jerks almost abolished, color blind, and with a vision of $\frac{20}{70}$, his central scotoma having partially cleared up. Lightning pains in the limbs had been so severe that he had constantly resorted to subcutaneous injections of morphia, and his arms and legs were everywhere covered by the resulting scars. A year later he could not walk without help, vision had sunk to $\frac{1}{20}$ (Sn. 20 deciphered at one foot with difficulty), and the knee jerks were entirely absent. Two years after his return to Pennsylvania and nine years after my first record of his case he died, and according to the account of his attending physician had been "stone blind" for several months.

Case II.—D. M., male, aged sixty-one, consulted me for occipital headache and double vision. He had paresis of the external rectus of the right eye, with gray discs and a broad scleral ring all round. The patellar-tendon reflexes were

prompt on both sides. The eyes were hypermetropic (1.50 D.), but even with this correction vision was only $\frac{6}{9}$.

He was given moderate doses of potassium iodide and mercuric bichloride, and was advised to give up his business and take a trip to the Nile, where in his own boat he could have perfect rest, and freedom from business worry. A year later he came back feeling much better and highly satisfied with the result of his holiday. The double vision had entirely disappeared; but examination showed that his optic nerves looked still grayer, and that the knee jerks, which a year previous had been prompt, were much diminished, that of the left leg being slightly greater than that of the right. Three years after the occurrence of the diplopia, he had become almost blind and his form field in the best eye was contracted to nine inches. His gait was ataxic and he could walk with difficulty with the aid of a stick. His memory was impaired and there was a general decline of mental vigor.

CASE III.—The third case is that of a male patient, thirty-eight years old, with well marked tabes probably syphilitic in its origin. He had had an indurated chancre fifteen years previously, but denied ever having had any secondary symptoms. He had suffered from shooting pains for three years, and at the time of examination he had an ataxic gait. The knee jerk was absent on the left side and very much diminished on the right. His optic nerves were very gray, his pupils were small and contracted but slightly either from exposure to light or from accommodative effort. A month previous he had had transient ptosis of the left upper eyelid. Vision was $\frac{6}{6}$ in each eye, and the color fields were much contracted. His accommodation was also much impaired, and with + 2 D. he could not read Jr. I. inside of 30 centimetres. His pupils resisted mydriatics, and even under a full dose of atropia would not dilate to more than four millimetres. This is a striking but not unusual phenomenon in such cases, and I believe we are indebted to Trousseau for first calling attention to it.

The most interesting point of this case from an ophthalmological stand point was the variation in the amount of his accommodation. Ten days after the first examination it had

risen from one dioptric to four dioptrics, and the patient remarked that this was "one of his good days, and that he was usually obliged to hold his book much further off." The writer had never before encountered a similar variation in the accommodation of tabetics, but he can readily understand that it may at times occur in the stage of irritation before the nerves and their central nuclei settle down to the dead level of atrophy.

DISCUSSION.

Dr. Knapp.—This paper should have a very extensive discussion. It is only on account of the advanced time that I do not offer to take part in it. It is particularly important on account of tracing the early stage of optic nerve atrophy.

In Memoriam.

On the 12th of April, 1885, after a protracted illness, Dr. Edward Talbot Ely died at his home in Rochester, N. Y.

Dr. Ely was the youngest son of the late William W. Ely, M.D., LL.D., of Rochester, N. Y. He was born in Rochester, N. Y., on the 2d of October, 1850. He was graduated at the Rochester University in 1871, and at the College of Physicians and Surgeons, New York, in 1874. After graduation he served in the Presbyterian and Charity Hospitals, New York. In 1875 he became professionally associated with Dr. D. B. St. John Roosa in New York, an association which continued until interrupted by his sudden and fatal illness in 1882, at which period he was Assistant Surgeon to the Manhattan Eye and Ear Hospital, Surgeon to Charity Hospital, and Associate Professor of Ophthalmology and Otology in the then newly organized New York Post Graduate School of Medicine. He became a member of the American Ophthalmological Society in 1878. Dr. Ely enriched ophthalmic and otologic literature

with numerous contributions, the character of which was of a high order, and always received respectful consideration from the profession. Dr. Ely was a man of generous sympathies and high personal character. He was able, quiet, of a cautious temperament, and gifted with a strong sense, a vigorous moral feeling, and a most graceful frankness of deportment. His information was varied and exact. His profession afforded the best means of displaying the natural benevolence of his heart. He was devoted to the interests of his patients, possessed their confidence, and his geniality and sincerity were so evident that no person who came under their influence could escape being attracted by them.

Dr. Ely was married in March, 1882, to Miss Emma L. Weber, of New York, and in July he sailed for Europe. Soon after his return, in October, 1882, he was suddenly seized with pulmonary hæmorrhage, followed by others in close succession. After a few months spent in his native city he went to Colorado Springs, where his health improved during the winter. Under the influences of the climate of Colorado his pulmonary trouble had become inactive, and in the last year of his sickness had given him but little inconvenience; but a few months after the pulmonary hæmorrhage a chronic abscess developed in his left hip, maintained by extensive necrosis of the left sacro-iliac joint, and these dreadful complications tortured him to the end.

Still a young man, Dr. Ely was cut down at a period when he had already impressed his value upon his profession and the community in which he worked; and his death is most sincerely to be deplored, for the loss to his family and to society at large, to his friends, and to all who enjoyed the privilege of knowing him.

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Grundlagen der Verbrennungstechnik

Prof. Dr.-Ing. Klaus Dietz

TRANSACTIONS

OF THE

AMERICAN

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OF THE

AMERICAN OPHTHALMOLOGICAL SOCIETY,

1886-87.

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Dr. Charles H. Williams.....Boston, Mass.
Dr. E. Williams.....Cincinnati, O.
Dr. Henry W. Williams.....Boston, Mass.
Dr. J. P. Worrell.....Terre Haute, Ind.

Total.....92.

HONORARY MEMBERS.

Dr. C. Schweigger.....Berlin, Prussia.

Total.....1.
Whole Number.....93.

MINUTES OF THE PROCEEDINGS.

TWENTY-SECOND ANNUAL MEETING.

PEQUOT HOUSE,
NEW LONDON, *July 21, 1886.*

THE Twenty-Second Annual Meeting was called to order by the President, DR. WM. F. NORRIS, at 10 A.M. The following Committees were appointed:

Committee on Bulletin—DRS. E. GRUENING and S. D. RISLEY.

Auditing Committee—DR. G. HAY.

Committee on Membership—DRS. JOHN GREEN, G. C. HARLAN, A. MATHEWSON, S. THEOBALD, J. J. B. VERMYNE.

The Treasurer's Report was read and referred to the Auditing Committee. It was subsequently accepted, and ordered to be placed on file.

The Secretary read a communication from the American Surgical Association, in which a plan was proposed for uniting several medical societies, under the name of "the Congress of American Physicians and Surgeons," and the American Ophthalmological Society was requested to appoint a Committee of five for conference on the subject.

On motion of Dr. Agnew, it was resolved: that the communication of the American Surgical Association be and hereby is referred to a Committee of three for consideration, and report to this session.

DRS. C. R. AGNEW, C. S. BULL and B. E. FRYER were appointed as this Committee.

The following gentlemen were invited to attend the meeting: DR. G. M. SMITH, New York; DR. GEO. R. CUT-

TER, Brooklyn, N. Y.; DR. E. FRIEDENBERG, New York; DR. GEO. A. PETERS, New York; DR. A. A. HUBBELL, Buffalo, N. Y.; DR. H. DE W. CARVELLE, Manchester, N. H.; DR. W. SPENCER, U. S. Army.

The Bulletin Committee reported, and the following papers were read:

1. "Remarks on Pyogenic Micro-Organisms, with Demonstrations and Experiments," by Dr. H. Knapp. Discussed by Drs. Webster, Strawbridge, Knapp, Norris, Fryer, H. D. Noyes, Hubbell, Andrews and Green.

2. "An Analysis of One Hundred Cases of Exudative Retinitis, occurring in the course of Bright's Disease," by Dr. C. S. Bull. Discussed by Drs. Norris, Carmalt, Gruening, Little, Webster, Fryer, Hay, Wadsworth and Noyes.

3. "Thrombosis and Perivasculitis of Retinal Vessels," by Dr. G. C. Harlan. Discussed by Dr. Norris.

4. "New Test Type," by Dr. W. S. Dennett.

5. "Possible Retardation of Retinitis Pigmentosa," by Dr. H. Derby. Discussed by Drs. Little, Fox, Harlan, Strawbridge, Theobald, Risley and Wadsworth.

6. "The Equivalence of Cylindrical and Sphero-Cylindrical Lenses," by Dr. E. Jackson. Discussed by Drs. Hay, Jackson, Dennett and Little.

7. "On the Combination of two Cylinder Lenses," by Dr. G. Hay.

The Committee to consider the communication of the American Surgical Association made the following report, which was adopted.

The Committee to whom was referred the communication of the American Surgical Association, relating to a proposed convention or congress of medical societies, and asking that the American Ophthalmological Society would appoint a Committee of five (5) for conference on said subject, would respectfully report the following two resolutions, and recommend their adoption.

Resolved,—That a Committee of five (5) be appointed by this Society and authorized to confer with committees from other

medical societies with regard to the organization of a convention or congress of such societies, and to report at the next meeting of this Society.

Resolved,—That it is the sense of this Society that its welfare would be put in peril by any alliance or coöperation which would interfere with its autonomy or independent meetings.

Adjourned to meet at 3 P.M.

Meeting called to order at 3 P.M.

Reading of papers resumed.

8. "The Report of Two Hundred and Sixty-three Cases of Cataract Extraction, with particular Reference to the After-Treatment," by Dr. G. Strawbridge.

9. "Cataract Extraction without Iridectomy," by Dr. H. Knapp.

10. "Report of Fifty Cases of Cataract Extraction, by Dr. D. Webster.

11. "Death of Patient on Fifth Day after Extraction of Hard Cataract—Specimen," by Dr. H. D. Noyes. Discussed by Drs. Jeffries, Agnew, Green, Norris, Mittendorf, Thomson, Gruening, H. D. Noyes, Theobald, Fryer and Randall.

12. "Some Medico-Legal Cases," by Dr. B. Joy Jeffries.

13. "Description and Exhibition of a Series of Wools for the Scientific Detection of Subnormal Color Perception (Color Blindness)," by Dr. C. A. Oliver.

14. "Holmgren's and Thomson's Worsteds in a New Form," by Dr. W. S. Dennett. Discussed by Drs. Oliver, Jeffries and Dennett.

Adjourned to meet at 8 P.M.

Meeting called to order at 8 P.M.

Dr. St. John presented a communication on the first Eye Institution in the country, which was referred to the Committee on Publication.

Reading of papers resumed.

15. "An Aim to show the Effect of the Electric Light on the Eye," by Dr. J. A. Andrews. Discussed by Drs. Agnew and Mittendorf.

16. "A Method of Overcoming Diplopia when Prisms are not fully Effective," by Dr. W. S. Little. Discussed by Dr. Harlan.

17. "Two Epidemics of Molluscum Contagiosum," by Dr. W. F. Mittendorf.

18. "A Case of Melano-Sarcoma of Conjunctiva and Cornea," by Dr. W. F. Mittendorf. Discussed by Drs. Knapp, H. D. Noyes, Wadsworth, Randall and Lippincott.

19. "The Use of Hot Water in Some of the Conjunctival and Corneal Affections," by Dr. B. E. Fryer. Discussed by Drs. Prout, Norris and Theobald.

20. "Some Remarks on Asthenopia and on the Changes of Refraction in Adolescent and Adult Eyes," by Dr. W. F. Norris. Discussed by Drs. Theobald, Harlan, Gruening, Risley, Randall and Norris.

Adjourned to meet at 10 A.M., July 22d.

July 22d.

Meeting called to order at 10 A.M.

Reading of papers resumed.

21. "The Amblyopia of Squinting Eyes: is it a Determining Cause, or a Consequence of the Squint?" by Dr. S. Theobald. Discussed by Drs. Noyes, Wadsworth, Harlan, Mittendorf and Theobald.

22. "A Case of Multiple Rupture of the Eyeball, with Partial Dislocation of the Lens into the Anterior Chamber; Recession, and Recovery with Some Vision," by Dr. B. A. Randall.

23. "Subluxation of Lens, with Double Rupture of the Choroid—Recovery with Good Vision," by Dr. B. A. Randall.

24. "Badal's Operation; Laceration of the Infra-Trochlear Nerve." by Dr. J. S. Prout. Discussed by Dr. Bull.

25. "A Successful Case of Badal's Operation," by Dr. D. Webster.

Dr. Knapp showed the rabbits operated on at the first session.

26. "Advancement of Tenon's Capsule," by Dr. H. Knapp. Discussed by Drs. Theobald, Holt, Harlan and Knapp.

27. "A Case of Tumor of the Left Occipital Lobe, with Right Homonymous Hemianopia," by Dr. E. Gruening. Discussed by Drs. Noyes, Loring, Wadsworth, Jackson and Mittendorf.

28. "A Case of New Formation in the Vitreous of both Eyes," by Dr. J. S. Prout. Discussed by Drs. Mittendorf and Harlan.

29. "A Lens Series for the Refraction Ophthalmoscope," by Dr. E. Jackson.

30. "A New Series of Test Letters," by Dr. J. Green.

31. "A New Series of Test Types," by Dr. C. A. Oliver.

32. "Photograph of the Brain, showing want of the Optic Commissure,—Other Commissures also Absent" (for Dr. Wilmarth), by Dr. W. S. Little.

33. "Case of Albuminuric Retinitis; Induced Premature Labor," by Dr. S. D. Risley.

34. "Modification of Dr. Dyer's Perimeter," by Dr. W. S. Dennett.

35. "Modified Loring Ophthalmoscope," by Dr. B. A. Randall.

36. "On the Frequent Instillation of two per cent. Solution of Nitrate of Silver in Purulent Ophthalmia," by Dr. J. A. Andrews. Discussed by Drs. Norris, Andrews and Mittendorf.

37. "An Impervious Sponge Cover for Ether Inhalation," by Dr. R. Murdock.

38. "Measurements of Astigmatism by the Ophthalmometer of Javal and Schiotz," by Dr. H. D. Noyes.

39. "Burns by Fulminate of Silver and Fulminate of Mercury," by Dr. H. D. Noyes.

40. "Cases of Foreign Body in the Globe, including Two Cases of its Spontaneous Expulsion, and Cases in which Impaction in the Wall of the Globe defeated the Successful Use of the Magnet," by Dr. H. D. Noyes.

The Society then went into executive session.

On motion of Dr. Dennett, it was

Voted,—That the time of election and number of members requisite for election be referred to the Committee on Membership, to report at the next meeting of the Society.

On recommendation of the Committee on Membership it was

Voted,—That the meeting of 1887 be held at the Pequot House, New London.

Voted,—That the time of the meeting be extended to include the whole of Thursday.

The President announced as the Committee to confer with committees of other medical societies with regard to the organization of a convention or congress: Dr. O. F. Wadsworth, Boston; Dr. C. S. Bull, New York; Dr. G. C. Harlan, Philadelphia; Dr. S. Theobald, Baltimore; Dr. B. E. Fryer, Kansas City.

The following officers were elected for the ensuing year:

President—Dr. William F. Norris.
Vice-President—Dr. H. Derby.
Secretary and Treasurer—Dr. O. F. Wadsworth.
Corresponding Secretary—Dr. J. S. Prout.
Publishing Committee—The Secretary (*Ex-Officio*), Drs. G. Hay and H. Derby.

Voted,—That the assessment for 1886–1887 be five dollars.

Adjourned.

Present at the Twenty-second Annual Meeting:

Dr. C. R. Agnew.
Dr. J. A. Andrews.
Dr. William T. Bacon.
Dr. Charles S. Bull.
Dr. Peter A. Callan.
Dr. F. P. Capron.
Dr. W. H. Carmalt.
Dr. W. S. Dennett.
Dr. Hasket Derby.
Dr. Richard H. Derby.
Dr. Lewis S. Dixon.
Dr. L. Webster Fox.
Dr. B. E. Fryer.
Dr. John Green.
Dr. Emil Gruening.
Dr. George C. Harlan.
Dr. Gustavus Hay.
Dr. E. E. Holt.
Dr. Edward Jackson.
Dr. B. Joy Jeffries.
Dr. Samuel J. Jones.
Dr. H. Knapp.
Dr. J. A. Lippincott.
Dr. W. S. Little.
Dr. Edward G. Loring.
Dr. Arthur Mathewson.
Dr. H. G. Miller.
Dr. W. F. Mittendorf.
Dr. Russell Murdoch.
Dr. William F. Norris.
Dr. Henry D. Noyes.
Dr. Charles A. Oliver.
Dr. J. S. Prout.
Dr. B. Alex. Randall.
Dr. Samuel D. Risley.
Dr. H. S. Schell.
Dr. Myles Standish.
Dr. Samuel B. St. John.
Dr. George Strawbridge.
Dr. Samuel Theobald.
Dr. William Thomson.
Dr. J. J. B. Vermyne.
Dr. O. F. Wadsworth.
Dr. David Webster.

Present by invitation:

Dr. G. M. Smith, New York; Dr. George R. Cutter, Brooklyn, N. Y.; Dr. E. Friedenberg, New York; Dr. George A. Peters, New York; Dr. A. A. Hubbell, Buffalo, N. Y.; Dr. W. Spencer, U. S. Army; Dr. H. De W. Carvelle, Manchester, N. H.

O. F. Wadsworth,
Secretary.

ANALYSIS OF ONE HUNDRED AND THREE CASES OF EXUDATIVE NEURO-RETINITIS, ASSOCIATED WITH CHRONIC BRIGHT'S DISEASE.

By CHARLES STEDMAN BULL, M.D.,
NEW YORK.

In presenting to the consideration of the Society some points in the course, duration and prognosis of so-called Neuro-Retinitis Albuminurica, which have seemed to the writer to be of some interest, it should be stated that only such cases have been considered as were originally examined by the writer himself, and which he had been able to follow to their termination. All cases of renal disease with retinal complications, which were due to scarlatina or pregnancy, were rigidly excluded. Out of a total number of somewhat more than five hundred cases examined, I have been able to follow up to the present time only one hundred and three (103) cases, or about one fifth of the whole number; the remaining four fifths, or about eighty per cent., having disappeared from view. The observation of these one hundred and three cases covers a period of time of thirteen years and six months. In every case the ophthalmoscopic examination was made by myself, while the visual acuity and visual field were measured by competent assistants. The urine of each patient was examined both chemically and microscopically by myself. Where it was possible to do so, the entire amount of urine passed in the twenty-four hours was tested as to reaction, specific gravity, color, amount of albumen and sugar, and the presence of casts, and the results were carefully tabulated. The heart was carefully examined in every case; and where one examination was not perfectly satisfactory, a second one was always made.

The period of duration of the retinal inflammation, as indicated by the symptoms complained of by the patients, varied in the hundred and three cases between three days and three years, but in many cases of considerable chronicity the patients were unable to set any exact period for the beginning of the failure of vision. In the large majority of cases both eyes were affected when the patient first came under observation, though by no means always in the same degree, there being in many cases a marked difference in the two eyes.

The period of duration of the renal disease, as indicated by the occurrence of the symptoms, was very difficult to determine. In fifty-six (56) cases, or more than fifty per cent., it was entirely unknown. In forty-seven (47) cases, or somewhat less than fifty per cent., it varied from six months to several years.

The sex of the patients was nearly evenly divided between males and females, fifty-six being men and forty-seven being women.

The age of the patients varied between five years and seventy-eight years.

The vision ranged between $\frac{20}{20}$ and zero. It was improved by constitutional and local means in thirty-two cases, or about 31.5 per cent.; but this was mainly due to an improvement in the renal disease and in the general health, and was not permanent; for as the disease in the kidneys reasserted itself and the general health failed, fresh exudation, or hæmorrhages, or both occurred in the retina, and vision again deteriorated.

Uræmic amblyopia, or transient attacks of more or less complete blindness in one or both eyes, occurred in thirty-seven (37) cases; but in all of these cases retinitis or neuro-retinitis was present.

Both eyes were affected at the time of examination in fifty-four (54) cases, and both eyes became affected while the patients were under observation in ninety-three (93) cases. The *right* eye was first affected in twenty-seven (27) cases, and the *left* eye was first affected in twenty-two (22) cases.

The retina alone was inflamed in both eyes in eighty (80) cases. In the *right* eye alone the retina was inflamed in

eleven (11) cases, and in the *left* eye alone in twelve (12) cases.

The optic nerve and retina were inflamed in both eyes in about twenty-five (25) per cent. of the cases. They were both inflamed in the *right* eye alone in sixteen (16) cases, and in the *left* eye alone in thirteen (13) cases.

Hæmorrhages occurred in both eyes in forty-six (46) cases. They occurred in the *right* eye alone in eleven (11) cases, and in the *left* eye alone in twelve (12) cases. In thirty-four (34) cases there were no hæmorrhages. In thirty (30) of these thirty-four (34) cases there was hypertrophy of the left side of the heart, while in the sixty-nine (69) cases in which hæmorrhages occurred, there were five (5) in which there was no cardiac disease demonstrable.

Hypertrophy of the left side of the heart, *without* valvular disease, occurred in seventy-nine (79) cases. There was hypertrophy of the left side of the heart *with* valvular disease in sixteen (16) cases. In eight (8) cases there was no cardiac disease at the time of the first examination, though hypertrophy of the left side subsequently developed in all but three (3) cases.

In many of the cases examined there were visible in the retina the white lines along the arteries, which constitutes the so-called vascular hypertrophy, so well described by all writers on this subject. But in many of the cases, even those in which the heart was hypertrophied, no such change was to be seen in the retinal arteries as we are accustomed to designate by the name of perivasculitis retinæ.

I have not been fortunate enough to examine any case early enough in the course of the retinal disease to see it in what Leber calls its first stage, or that of marked retinal and papillary hyperæmia, accompanied by an œdematous infiltration; though I have seen the œdema in what Leber would call the second stage, accompanied by the yellowish fatty degeneration. Here it is certainly due to increased vascular tension, for it varied with the state of the circulation and was susceptible of recovery. In this second stage, I have seen the margin of the papilla alone infiltrated, with the centre not in-

volved, and with more or less space between the infiltrated papillary margin and the yellowish exudation in the region of the macula. In a few cases I have seen a pure papillitis, resembling the "choked disc" met with in intracranial tumor, without any exudation into the retina; but if such cases be kept under observation long enough, the retinal exudation in and about the macula will be sure to occur, though not necessarily in the stellate form, supposed to be typical of the disease. The yellowish exudation regarded as marking the second stage I believe to be entirely independent of the occurrence of hæmorrhages, having no connection with either their number or size. This exudation, which marks the fatty change dependent on arterial degeneration, is now generally regarded as an index of chronicity in the renal disease, and by some as the issue, direct or indirect, of the increased arterial tension which loss of renal function in many shapes may entail. It seldom occurs independently of renal fibrosis, and almost never without being preceded by hypertrophy of the left side of the heart. It seems now to be a generally accepted view by pathologists that the cardiac hypertrophy is not caused by the arterial thickening, but results in common with it from the capillary obstruction; for this idea seems to be proved by the frequent development of cardiac hypertrophy before corresponding changes are noted in the arteries, and also by the general absence of cardiac alteration in lardaceous disease, where the arteries, though not affected in the same way, are as much thickened and apparently as obstructed as in other forms of albuminuria. But though these vascular changes occur so constantly in the kidneys and some other organs of the body, they are by no means always met with in the retina. Though the ophthalmoscopic picture of white lines along the retinal arteries is very often seen in these cases of exudative neuro-retinitis, there were many of them which showed no such visible proof of the hypertrophy of the muscular and fibrous coats, and a consequent diminution of the vascular calibre. In these cases, if the vascular coats were thickened, the hypertrophy was not extensive enough to admit of being seen by the enlargement produced by the ophthalmoscopic

image, and however constantly this vascular change may be [illegible] hypertrophy of the left ventricle to other parts of the body, it is not so with the retinal vessels.

As regards the retinal hæmorrhages, it is no doubt true that their occurrence is intimately connected with a diseased condition of the blood-vessels. They almost always occur suddenly and are apt to affect both eyes, though not necessarily simultaneously, and by no means commonly symmetrically. Cases have been reported in which they caused extensive scotomata; but I have met with but three such cases. In one case, where the left eye was first affected, there was a large hæmorrhage at the macula which extended well over towards the margin of the optic disc, and here an examination of the field showed an irregular central scotoma of an average diameter of 20°. In another case, also of the left eye, there was a small central scotoma corresponding to a hæmorrhage which covered the entire macula. In a third case, in which both eyes were affected, there was a large hæmorrhage in the region of the macula in both eyes, and a corresponding irregular central scotoma in the field of each eye.

A single instance of colored vision occurred among the whole number. The patient, a woman, who had suffered from Bright's disease for three years, who had both hypertrophy and valvular disease of the heart, and in whom both eyes showed the typical form of neuro-retinitis albuminurica, complained constantly of erythropsia, and said that everything appeared as if seen through red smoke. In this case there were no retinal hæmorrhages.

The third stage of the retinal process, as described by Leber, or that of retrograde metamorphosis of the retinal exudation, is worthy of close and continued observation.

In the thirty-two (32) cases in which the vision improved for a time, while the patient was under constitutional treatment, there was in all a perceptible change in the appearance of the fundus, which in some cases was very marked. There was in all a complete disappearance of the œdematous infiltration of the retina and disc, and in some a perceptible absorption of the yellow exudation in the retina around the

macula and between it and the optic disc. But I have never in any case seen any signs of absorption in the peculiar glistening stellate exudation at the macula, even in those cases in which the improvement of vision was most marked. Leber refers particularly to the absorption of the exudation which takes place in those cases of renal disease which are cured, or which are brought to a stand-still; but I very much doubt whether any case of chronic interstitial nephritis, which has lasted long enough to cause cardiac hypertrophy and neuro-retinitis, is ever cured. I do not remember ever to have seen a case in which the retinal exudation was entirely re-absorbed. The retrograde metamorphosis I believe to be always an incomplete process, and though the exudative process may remain for a time quiescent, I believe that in the great majority of cases, if not in all, this state of partial metamorphosis is always followed by a recurrence of the inflammatory process in the retina and fresh exudation, dependent indirectly on an exacerbation of the renal disease, through the medium of fresh cardio-vascular changes. In the more unfavorable cases, where both retinitis and neuritis have been marked, another and still more unfavorable change occurs. As the immediate inflammatory symptoms subside, and the œdema of the optic disc and retina disappears, the papilla regains more or less completely its regularly defined outline, and in some cases even may become as sharply defined as normal; but instead of retaining the greyish- or whitish-yellow hue of inflammation, or of regaining the rosy-gray hue of health, it becomes discolored, grows more and more white, and finally assumes the appearance of atrophy following a neuritis descendens. The arteries become diminished in calibre and begin to show white lines along their walls, and these changes become more and more marked as time elapses, and we have then to deal with a hopelessly atrophic papilla.

An examination of these one hundred and three cases with special reference to the duration of life, has impressed me very strongly with the extremely unfavorable prognosis to be made, and with the comparatively short lease of life which these patients still possess. Of the one hundred and three

cases examined, extending over a period of thirteen years and six months, eighty-six have died and seventeen are still living. Of the eighty-six (86) who have died, fifty-seven (57) died within the first year; eighteen (18) within the second year; six (6) within the third year; four (4) within the fourth year; and one within the sixth year. Of the fifty-seven (57) who died within the first year, thirty (30) died within six months. One died within ten days of the first examination; one in three weeks; eight within two months; six within three months; seven within four months; three within five months; four within six months; three within seven months; six within eight months; four within nine months; three within ten months; one within eleven months; ten within twelve months; two within fourteen months; one within fifteen months; one within sixteen months; three within eighteen months; one within twenty months; ten within twenty-four months; six within three years; four within the fourth year; and one within the sixth year.

Of the seventeen (17) patients who are still living, fourteen (14) were seen for the first time within the last six months, and in all but one of these fourteen, the renal disease had probably lasted a considerable time. Two of those still living were first seen within the past year, and one of the seventeen was first seen seven years ago and has been examined at intervals since. In this last case the stellate exudation at the macula still continues unchanged, but although there has been but little change of vision for several years, the renal disease is still present, as shown by the urine and certain head symptoms. It will thus be seen that of the one hundred and three (103) patients examined, fifty-seven or more than fifty per cent. died within the first year, and thirty of these died within the first six months; a fatality which is not only marked, but for a chronic disease unusually rapid.

A rather unusual complication was observed in four cases in the presence in the urine of sugar as well as albumen. In one of these cases, both eyes were affected, the right eye much more than the left eye, and there was cardiac hypertrophy. The amount of sugar varied with every examination that was

made of the urine, and was never large. The patient died in eight months. The second case, in which both eyes were affected, showed also a varying amount of sugar, as well as albumen and casts. This patient also died in eight months. In both these cases there were retinal hæmorrhages. The third case, in which both eyes were affected, showed considerable sugar from the beginning, but it disappeared from the urine before the death of the patient, which occurred in fourteen months. The fourth case, in which both eyes were affected, showed a small amount of sugar at first, which has varied in quantity at different times. This patient is still living. There were no retinal hæmorrhages in either of these last two cases.

DISCUSSION.

Dr. Norris.—I have seen many cases of retinitis albuminurica and I agree with Dr. Bull that it is very rare, in fact never occurs, to have all the macular changes disappear in cases of chronic disease of the kidney. There are almost always traces of fatty degeneration in the neighborhood of the macula to be seen months afterward, even if vision has become good.

Dr. Carmalt.—Can Dr. Bull form any estimate as to the time of death as between the presence of hæmorrhage or simply of fatty white spots?

Dr. Bull.—I have not been able to form any prognosis from the occurrence of hæmorrhage.

Dr. Gruening.—This subject has been frequently discussed in the New York Ophthalmological Society. At one of the last meetings I stated my experience, which in the main agrees with that of Dr. Bull. I had collated all my cases (more than one hundred), and I found that none of these cases lived more than two years after the diagnosis of retinitis albuminurica had been made. I speak only of those cases in which the typical stellate changes were seen in the maculæ of both eyes. Since reporting these cases, I have seen these changes confined to the macula of one eye. There is no evidence of Bright's disease in that case. Dr. Agnew saw this case with me. That is the first time that I have seen this change in the macula without disease of the kidney.

DR. LITTLE.—I would ask Dr. Bull if the diminution of the conditions in the retina were any indication of a favorable prognosis?

DR. BULL.—I regard it as having no bearing.

DR. FRYER.—I would ask if in these cases albumen was ever absent from the urine, and if so, if any examinations were made for albuminose? I have noted in two cases that while albumen was absent from the urine, albuminose was present.

DR. BULL.—Albumen was absent quite often, but no examinations were made for the detection of albuminose.

DR. WEBSTER.—I am quite satisfied that, in very rare instances, these patients do recover their general health so as to live almost indefinitely. I remember a clergyman who called at our office some years ago. He had what any one would recognize as a typical picture of retinitis Brightii. He informed me that Dr. Prout, of Brooklyn, had examined his eyes ten or fifteen years previously and recognized the condition. He also had found albumen and casts, and had given an unfavorable prognosis. He was, however, still living and preaching. I had the urine examined and found a slight trace of albumen.

DR. HAY.—I wish to make an additional communication with reference to the case which I reported three or four years ago, in which there was ecchymosis of the conjunctiva and a swelling of the fundus supposed to be sarcomatous. It turned out to be a simple hæmorrhage between the choroid and sclerotic. The patient died suddenly six months later from apoplexy. The urine which was drawn before or shortly after death was loaded with albumen. There was no appearance of albuminuric retinitis.

DR. WADSWORTH.—I agree with Dr. Bull in regard to the general persistence of the stellate spots in the macula, but more than once I have seen such spots disappear entirely. This has been in cases of albuminuric retinitis which came on during pregnancy or immediately after. I recall one case in which the changes were very marked and vision was reduced to counting of fingers at a short distance. There were quite large, brilliant white spots. The albuminuria occurred with the first pregnancy. The patient recovered so completely, that in two or three years there was absolutely no sign to be made out in either eye, except pallor of the disk and some narrowing of the vessels. Vision was very fair. She had been confined a second time without any unpleasant symptoms.

I have also seen typical stellate deposits in cases of cerebral

tumor and in cases supposed to be meningitis, in which there was no albuminuria.

Dr. Gruening.—I wish to add that the cases of retinitis Brightii which we see in our offices differ from those which we see in the hospital. During the past seven years, I have examined all the cases of Bright's disease associated with eye trouble which have been admitted to the Mt. Sinai and the German Hospitals, and I find many of the patients entirely blind. Such patients we do not see in our offices. In these cases, we find marked retinal degeneration. I might also say that in a discussion which was held in one of the Vienna societies, the oculists maintained that these changes occur only with the small contracted kidney, because patients who have this kidney come to the office of the oculist. The patients with the large white kidney do not come to the office of the oculist, but find their way to the hospital. In the hospital we frequently find the large white kidney, while in private practice it is generally the contracted kidney,

Dr. Bull.—In regard to the point raised by Dr. Wadsworth, I stated in the beginning of my paper that all cases of albuminuric retinitis due to scarlet fever or pregnancy were excluded. I have repeatedly seen in such cases, the deposits completely absorbed and vision restored to normal.

With reference to the case referred to by Dr. Gruening in which the exudation was confined to one eye, I am very sure, from my experience, that if the case is watched the exudation will be found to appear in the other eye.

I do not wish to be understood as by any means endorsing the statement that the so called exudation in the region of the macula is typical of Bright's disease. I have seen it in cases of undoubted intra-cranial tumor and in cases supposed to be meningitis. Retinal exudation, other than stellate, I have seen not infrequently in cases of large white kidney. My observation tallies with that of Dr. Gruening, that cases of contracted kidney are seen in private practice, while the large white kidneys are seen in the hospital.

Dr. Noyes.—I should like to confirm the statements in regard to the relatively favorable prognosis of cases of retinitis albuminurica arising in connection with pregnancy or scarlet fever. This was well illustrated in a case brought to my office in which the patient had undergone all these conditions in the kidney, and yet recovered sight completely and lived for twelve years.

It is quite astonishing sometimes how much vision may improve without any alteration in the local appearances in the

retina and without any favorable change in the general condition, the improvement depending upon changes quite invisible to the naked eye.

I should like to make another observation to this effect, that within the past few years I remember to have seen a statement that an English observer in the out-patient department of one of the hospitals had examined all the cases of albuminuria admitted to that institution, and had found that in about sixty per cent. of the cases there was implication of the eye.

REMARKS ON PYOGENIC MICRO-ORGANISMS, WITH DEMONSTRATIONS AND EXPERIMENTS.

BY H. KNAPP, M.D.,
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DR. K. made some general remarks about the dependence of suppuration on certain kinds of micro-organisms, the pyogenic bacteria, of which pure cultures had been obtained during the last two years. He exhibited these bacteria in numerous test-tube specimens on agar-agar, further under the microscope, where also he showed microscopic slides of different tissues of the eye that had been infected with these germs. Then he showed two rabbits whose eyes he had operated on for cataract the day before, in the presence of members of the Society. Extraction had been made on the left eyes with clean instruments, on the right eyes with instruments contaminated with staphylococcus pyogenes aureus. The left eyes were free from secretion, the wound of the one in doubtful, of the other in good condition, whereas the right eyes discharged matter profusely, and were in a state of intense destructive inflammation. He then operated on two other rabbits, in the same way, before the Society. The four rabbits were exhibited again the next day and examined by the members of the Society. The right eyes in all were suppurating, the wounds of the left eyes in three of the rabbits were in good condition, in one of the first two

rabbits it was suppurating; this eye had become infected from the right eye of the other rabbit. They had been kept in the same box, and Dr. Knapp found them with their heads in close contact.

Dr. K. said that he had made these demonstrations in order to draw the attention of the gentlemen to this new and important field of inquiry, and he would be happy to furnish cultures of these and other organisms to anybody who intended to make investigations in this department.

DISCUSSION.

Dr. Webster.—I was present yesterday when Dr. Knapp operated on the two rabbits which he has exhibited. He did not operate on any of the eyes with any care. As cataract extractions, all the operations were done very badly. In the left eyes especially, he squeezed out not only the lenses, but also considerable of the vitreous humor. He then put in a blunt hook and stirred it around and scraped in the region of the ciliary body. If a human eye had been operated on in that way I should have expected to have seen it in a condition of pan-ophthalmitis the next day. I so said at the time. I must say, if it had not been for the Doctor's assurance, I should have been much surprised at the condition of the eyes. This experiment shows in a striking manner the effects of inoculation on the right eyes of these rabbits.

Dr. Strawbridge.—I would ask Dr. Knapp whether the result of these inoculations has shown anything as to the best method of cleansing instruments so as to protect against infection of this kind. Does he consider cleaning instruments with water and towel sufficient, or does he think that some extra means should be employed?

Dr. Knapp.—In the institutions of Europe, they lay the instruments in antiseptic solutions which dull the edge. I took particular care to examine this point. An instrument is clean when all its surfaces are bright, shining and polished. I have made experiments on this point. I have dipped a knife in an infecting solution and washed it with water. It produced purulent inflammation. I have contaminated a knife in the same way, washed it with water, then wiped and polished it with a towel; now it has produced no infection. Smooth instruments can be cleaned in this way, instruments that are

rough can not; for these we must use an antiseptic. In the Heidelberg surgical clinic I have been pleased to see that they do not lay smooth cutting instruments in antiseptic lotions. They cleanse them mechanically and have no infection from them. This is a manifest advantage, for when the edges are dull we are apt to make irregular sections, by more or less dragging and sawing. Instruments like forceps may be put in the antiseptic solution without disadvantage. Cataract knives are readily cleansed. Knives having a groove are more difficult to clean, and require particular care.

I think that these views are correct, and that in a short time they will carry the day and be the general practice. They are confirmed by the bacteriological experiments recently made. A knife is dipped into the infecting matter, and then cleaned with water and wiping. The blade is then dipped into all kinds of culture media, but nothing is produced.

The nutrient jellies are exceedingly sensitive to the action of micro-organisms. When there is the least quantity of microbes a growth will develope. If we find that no growth follows such an experiment, we have sufficient evidence that the instrument used was clean.

In the majority of our operations, it requires more than a minimum quantity of the infecting matter to produce suppuration. When blood or some liquid, for instance aqueous humor, flows out through the wound, large quantities of the infecting matter may be washed away and prove innocuous, but if anything is sucked in the reaction is very marked.

DR. NORRIS.—I would ask Dr. Knapp, how far his experiments show any inflammation apart from the pyogenic inflammation? Has he ever treated wounds with iodoform, carbolic acid, and other irritants, supposed to be anti-pyogenic? If so, is there any inflammation following such treatment, and how does it compare with the bacillus inflammation?

DR. KNAPP.—I have restricted my experiments to pure and infected wounds. In Paris and other places I have seen, however, that thick layers of iodoform were put on cataract wounds, and produced no inflammation.

The experiments can be varied in different directions, and the positive or negative answers can surely be expected to settle many a question of practical importance.

DR. FRYER.—There is one antiseptic lately come into use, which probably would not interfere with the edge of cutting instruments, that is hydro-naphthol. This has not been sufficiently long under observation to show how perfectly it

will sterilize instruments. The chances are that in strong solution it will.

It has also occurred to me that chloroform might perfectly sterilize instruments. I would ask Dr. Knapp if he has tried it?

Dr. Knapp.—I have had no experience with chloroform. The same was suggested of oil of eucalyptus, but it has fallen into oblivion.

Dr. Noyes.—Does alcohol affect the edges of instruments?

Dr. Knapp.—I think that it does.

Dr. Agnew.—I feel sure that 95% alcohol will dull the edges of instruments.

Dr. Hubbell.—This subject of the infection of wounds has a very important bearing upon operations on the human eye, and Dr. Knapp is demonstrating that certain forms of bacteria, at least on lower animals, have a prejudicial effect. It seems to me that his experiments bear principally upon the condition of instruments. I would ask if there are not special conditions of the eye or its appendages which would favor infection of the wound after operation?

I am led to ask this question on account of the special interest I have taken in this subject in connection with a case which I recently treated. A man, aged sixty, had had a cataract operation on one eye ten years ago, which was an entire failure. He came to me in May last with the other eye cataractous, and otherwise in a bad condition. There was ectropion of the lower lid, due to excessive hypertrophy of the conjunctiva, complete obstruction of the nasal duct, and a constant discharge of pus from the lachrymal sac. The conjunctiva of the upper lid was also granular and much thickened, and a large amount of pus was constantly discharging from the eye. When I first saw the patient I had been reading Dr. Knapp's article in the Archives of Ophthalmology, upon the subject of infection of wounds of the eye, and his experience made me fearful of disastrous results in an operation in this case. But an operation was necessary in order to give the patient vision, and I concluded to extract, as a last resort. After cleansing and treating the eye as well as I could for a week, I performed an iridectomy, and in two weeks after this did the extraction. Notwithstanding there was a constant discharge of pus, the patient had no drawback after either operation, and he recovered with good vision.

The question arises in my mind, how much has the condition of the eye and its surroundings to do with this subject of bacterial infection. Here was a bad case, but we had no in-

fection. The only antiseptic used was a saturated solution of boracic acid. I would ask what conditions would be most likely to present these bacteria and lead to infection of operation wounds of the eye?

DR. KNAPP.—I think that chronic purulent dacryocystitis and certain forms of chronic, even mild conjunctivitis, furnish the most favorable soil for the bacteria. In operating on such cases, if the disease cannot be radically cured before, particular precautions should be taken, and cocaine should not be used. As I said before, it requires a certain quantity of the pathogenic bacteria to produce infection. I have pricked the cornea to one or two thirds of its depth and spread over it an emulsion of pathogenic bacteria. Only about one in every four or five punctures developed an abscess. The same thing is seen in daily practice. It is not every case of lachrymal or conjunctival disease that exhibits suppuration after extraction. In doubtful cases, it would be proper to examine the secretion of the lachrymal sac and the conjunctiva bacteriologically.

DR. ANDREWS.—As directly bearing on the last words of the speaker, I might say that in every inoculation of the cornea, the anterior chamber and the vitreous chamber with the pathogenic material, I have not failed to produce the result shown to-day. I have frequently pricked the cornea and introduced a living growth of the staphylococcus pyogenes aureus into the conjunctival sac. In three or four cases, I have seen the operation followed by perfect recovery without any suppuration or inflammation. The *mere contact* of the microbe with the wound is not always sufficient to produce suppuration, especially in the case of the cornea, because it is washed away by the tears. I have never once seen a failure where the material has been introduced into the wound and has remained a sufficient length of time, in contact with the wound surface.

In regard to the suggestion to clean instruments by wiping with a towel, this might be bad practice in a hospital, where the towels are apt to be contaminated. This might perhaps be obviated by using absorbent cotton.

For washing instruments, I use an aseptic fluid. I secure clean water and boil it for some time. When cold I use this for washing my instruments. *I think that the chief value of antiseptic fluids is that you have something which you are sure is clean.*

THROMBOSIS AND PERI-VASCULITIS OF THE RETINAL VESSELS.

By GEORGE C. HARLAN, M.D.,
PHILADELPHIA, PA.

WITHOUT being at all sure that this view is the correct one, I use the term Thrombosis as suggesting a probable explanation of a condition of the retinal vessels whose pathology seems to be involved in much obscurity. I refer to that condition in which they appear, in the ophthalmoscopic examination, as snow-white bands of the same, or nearly the same, width as the normal vessels. This rather rare ophthalmoscopic appearance is variously attributed by authors who have reported cases to thrombosis, embolism, ischæmia, peri-vasculitis, and inflammatory or degenerative opacity of the vessel-walls. It is very probable, of course, that the cause may be different in different cases, and I will confine myself to the discussion of the following case, which is, at least, unusually well marked, and is, so far as I have been able to learn, unique in its completeness. The ophthalmoscopic picture that most nearly approaches it is a chromo-lithograph in Knapp's article on blindness in facial erysipelas. (Arch. of Ophth., vol. xiii.) In that, however, several of the larger vessels are still partially or completely filled with red blood.

F. V., a healthy looking married woman, thirty-three years of age, applied at the Eye and Ear Department of the Pennsylvania Hospital, June 5th, 1886, with the following history. Her father and a younger sister died of Bright's disease, and her mother of paralysis. Her own general health had been good, except that for the last two years she had suffered a good deal with headache, which at times had been severe but was much less so of late. She had a miscarriage in July, 1885, and was very ill for ten weeks, but recovered completely.

She again miscarried in January, 1886, but suffered little and was well in a few days. She had never had any trouble with her eyes, except that she was always short-sighted, until a few weeks before.

On May 6th she read the paper in the evening with usual comfort, and there was nothing to call attention to her eyes. On rising the next morning she noticed a dimness of vision in the left eye, but, on testing it, found that she could still read large print with the right eye closed. The dimness increased during the day, and the next morning there was not even light perception in the left eye. There was no pain or other symptom than blindness, and the other eye was not affected. She had no competent advice at the time, but was examined two weeks afterwards by a well-known ophthalmic surgeon, who pronounced her case to be one of embolism.

There was no indication of specific disease; her child, three years old, who accompanied her, was a picture of robust health, and her husband was a healthy-looking man. Dr. Richardson, the gynecologist of the out-door service, made an examination and pronounced her free from uterine disease. Dr. Fisher, who referred her from the medical clinic, reported that the heart sounds were normal. The sp. gr. of the urine was 1009; there was some albumen, but no casts could be found.

There was no light perception in the left eye. The media were clear. The ophthalmoscope showed hæmorrhages scattered all over the retina; none of them, with two or three exceptions, at all dense. Some were striated and extended in long streaks by the sides of the vessels, were found at all the bifurcations and in a few spots concealed the vessels. Others were in large, rounded, faint patches, with difficulty distinguished from the surrounding fundus. At the macula there were three groups of white spots embedded in dark pigment. The disc was opaque-looking and snow white, its margins slightly blurred. One thread-like arteriole, arising independently near the centre of the disc, and passing upward about two disc diameters, contained red blood. With this exception, all the retinal vessels, both arteries and veins, were converted into white bands and lines, appearing as if marked

out with chalk. Four or five experienced ophthalmoscopists searched repeatedly but in vain for a single red vessel. The vessels were nearly, if not quite, of normal size, possibly the arteries a little increased in width, and their margins were sharply defined. Fig. I., from a drawing made by Dr. P. N. R. Schwink, is an accurate picture of the fundus. Five or six weeks later the hæmorrhages had all been absorbed, but there was no other change in the ophthalmoscopic picture. The spots on the vessels that had been concealed by hæmorrhages were left white like the rest.

In the right eye there were several small hæmorrhages, and, on the temporal side of the disc, two indistinct, filmy, whitish patches. The macula was sound, and correction of a high degree of myopic astigmatism (—2.50) gave V. = $\frac{20}{30}$. The hæmorrhages were afterwards absorbed, and the whitish films disappeared, leaving the fundus almost normal.

The patient, who lives at some distance in the suburbs, promised to come on July 15th for another examination, but sent word that she had just had an attack of paralysis. My clinical assistant, Dr. Schwenk, visited her at her home and found a slight attack of partial hemiplegia of the left side. An examination of the urine now showed a small quantity of albumen and several hyaloid casts.

Supposing the account given of the course of the disease to be correct, the rapidity of the onset and the occurrence of complete blindness in a few hours would seem to exclude opacity of the vessel-walls; and the history furnished by the patient appears to be quite positive and reliable on this point. She volunteered the statement that she had been reading, without suspicion of her eyes, the evening before the trouble commenced, and was quite sure that she was still able to distinguish large print the next morning with the right eye closed.

Embolism would not of itself account for the appearance of the vessels, particularly of the arteries; as its immediate effect upon a retinal artery is to make it invisible if the obstruction is complete, or reduce it to a slender red thread if the obstruction is partial. It is true that an artery partially emptied by embolus might refill and a clot be formed in the

sluggish circulation, but even in this case the appearance of the vessel would still be due to thrombosis.

I would venture to suggest that the partial blindness of the first few hours might be the result of hæmorrhage, and the subsequent absolute blindness be due to thrombosis; though it must be admitted that a complete white thrombosis of a whole system of vessels, both arteries and veins, is contrary to our preconceived ideas, is opposed to experience in other regions, and has never been demonstrated in the eye.

Gowers says, "thrombosis is occasionally observed in the smaller branches of the veins, which then lose their double contour, *i. e.* their central reflection disappears, and they appear dark and large, their branches being unusually conspicuous. The condition usually depends on local causes." Also, "thrombosis has been observed in the retinal artery with ocular signs identical with those of embolism." Of course, a thrombosis with such signs could only be a plug of the main trunk, and not a clot extending the whole length of the vessel and involving its minutest branches.

According to Ziegler, "coagulation may take place in blood which is at rest, or in blood which is in motion, and the appearance of the thrombus is different in the two cases. In blood at rest, coagulation takes place through the whole mass simultaneously. The thrombus is thus dark red or brown in color, and consists of granular and fibrous clots of fibrin containing multitudes of red corpuscles and a few white corpuscles. Red thrombi of this kind are usually formed in occluded or highly engorged vessels. * * * * "When coagulation begins in blood which is still flowing, the entire mass does not coagulate at once; minute flakes separate out, consisting chiefly of white blood cells with a varying number of red blood cells. In the case of pure white thrombi, only the colorless elements of the blood separate out. When the necessary local conditions for coagulation are set up at any spot, the clots adhere to the surface, and gradually increase in size by successive additions. * * * * "Thrombosis depends upon two factors; one is the morbid alteration of the vessel-wall, the other the retardation or stoppage of the blood current. In most cases the two

factors are in action simultaneously." As to the second factor, as the heart was normal, there seems to have been no cause beyond the eye to retard the circulation; as to the first, the retinal hæmorrhages, the albuminuria, the family history and the subsequent paralysis leave no doubt of a diseased condition of the vessels.

I am not pathologist enough to know how long the condition I have supposed could continue without an organization of the clot, or just what changes in the appearance of the vessels are to be expected from that process. Ziegler believes that migrating white blood discs are chiefly concerned in the organization of thrombi, and that proliferation of the endothelium has little or nothing to do with it.

Another possible explanation of this case occurs to me in the supposition that disease might have been progressing for some time in the outer walls or sheaths of the vessels, and, not interfering materially with the circulation, might not have occasioned sufficient disturbance of vision to attract the patient's attention until the hæmorrhage occurred; though this would scarcely account satisfactorily for the sudden occurrence of absolute blindness. The term "peri-vasculitis" occurs, I believe, only in ophthalmological literature, though a similar pathological condition has been observed, post mortem, in the vessels of the brain, where much the same anatomical structure of the peri-vascular sheath prevails.

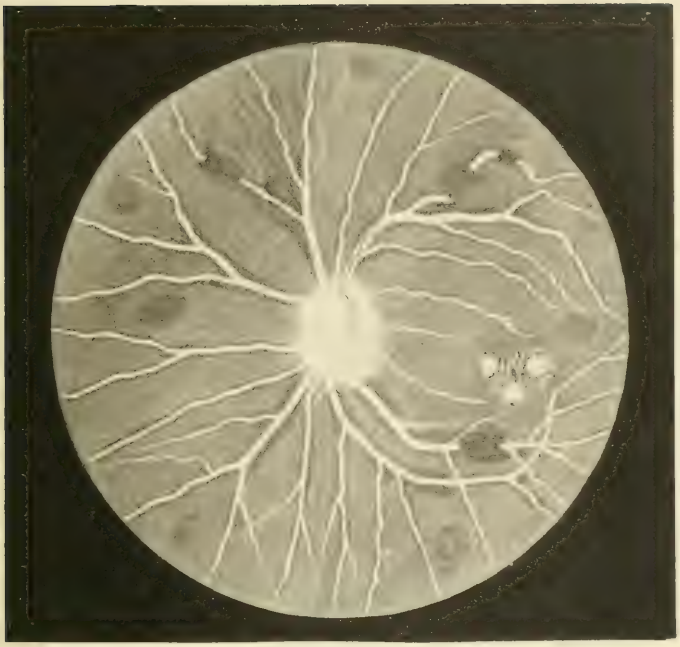
Wecker (Maladies des Yeux) refers to three observations of what he calls "peri-vascular retinitis." One is the description by Iwanoff of the examination of an injured eye that had been enucleated on account of sympathetic imitation of its fellow. All the retinal vessels were transformed into white cords. Some of the larger vessels had double the normal width; while others were less thickened, and, with a glass, globules of red blood could be seen within them. Under the microscope the interior of the vessels was found intact and filled with blood. The morbid change was in the external envelope or adventitious membrane, which was thickened and opaque. The microscopic appearances are given in detail. The second was a case of a patient with albuminuria treated

at Wecker's clinic from the commencement of the failure of vision. At first there was general opacity of the retina, particularly about the disc, the margins of which were obscured. Two or three weeks afterwards the retina commenced to clear and at the same time the larger vessels began to be surrounded by a white coat, which at certain points enveloped them entirely. This change advanced until all the arteries, which were particularly affected, were converted into white bands of a diameter a little larger than the normal calibre. In some places the red blood was entirely concealed, and in others could be seen through the thin coating. Wecker presented this case to his class as one of fatty degeneration of the adventitious membrane of the retinal vessels. The third case is quoted from Nagel, who however considers it to be one of hypertrophy of the cellular tissue of the vascular walls; all the arteries in both eyes, except a few slender arterioles, were converted into white cords. In some the blood could be seen as a fine red line along the axes. Some peripheral branches of the veins were also affected. The patient's general health was good; blindness was not complete, and the progress of the morbid changes was very slow.

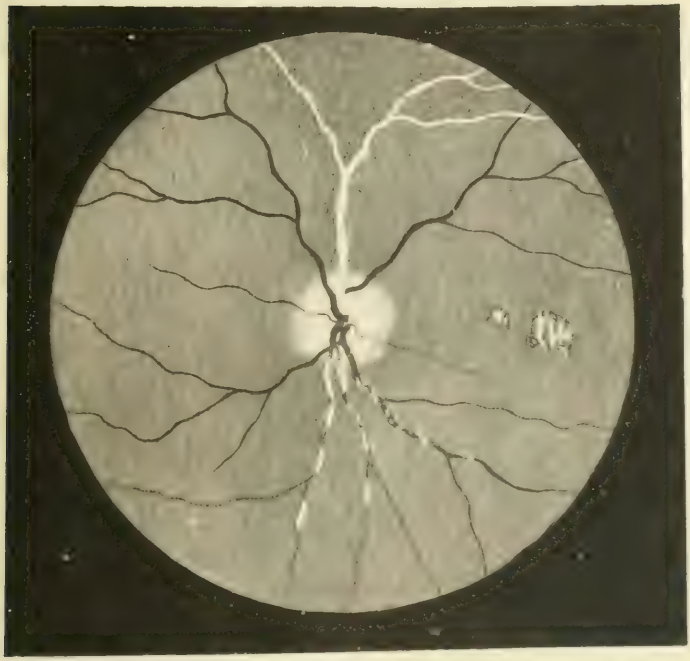
Leber (Græfe-Samisch, v. 5, p. 530) speaks of fatty and chalky degeneration of the vessels, and says that in marked cases of the latter the vessels may become stiff, white, opaque tubes. This occurs in eyes destroyed by intraocular inflammation. In nephritic retinitis, the walls of the vessels are sometimes changed into yellowish white glistening tubes, whose calibre is narrowed, and in some places occluded. "Pronounced fatty degeneration and calcification must naturally be associated with complete opacity of the vessel-walls, but this has as yet scarcely ever been seen ophthalmoscopically."

Gowers says, "in very rare cases, there is such a thickening of the outer coat of the vessels, or an increase of its perivascular sheath, that the tissue is visible not merely on the sides of the vessel but in front of it, and broad white lines then indicate the position and course of the vessels. These may cease suddenly, and lengths of red blood may alternate with the white bands. * * * * In all inflammatory conditions,

I.



II.



Schwenk Del.

leucocytes may accumulate in the peri-vascular sheaths of vessels, and in the retina they may give rise to an appearance similar to that just described, and which has been termed "peri-vasculitis." It has been said by Liebreich, that by a careful examination of the relative width of the column of blood and of the white band, an opinion may be formed of the position of the new tissue, whether in or outside of the wall of the vessel. In the case just described, the white bands correspond so nearly in width to the normal calibre of the vessels, and their margins are so uniform and so clearly defined, that it is difficult to resist the conclusion that the appearance is due to changes within the vessels. Certainly the ophthalmoscopic picture does not closely correspond to the appearances noted in any of the cases that I have seen accurately detailed as peri-vasculitis.

By way of comparison I present an ophthalmoscopic picture of another case that was under observation at the same time, and which seems to me to be one of opacity from peri-vasculitis. It is that of a negro woman, beyond middle age, partially blind for a long time, with no definite history, but with evident marks of extensive intraocular inflammation. The right eye was quite blind, with wide and firm posterior synechiæ of the iris and dense inflammatory cataract. In the left eye V. $= \frac{20}{100}$. There were several slight synechiæ, the lens was hazy, obscuring but not concealing the fundus, the disc was pale and there was a pigmented choroidal atrophy at the macula. A large artery running almost directly upward was completely converted into a white chalky-looking band with somewhat ragged margins and of varying width. There was no red blood seen in it from its entrance on the disc to the farthest point to which it could be followed. In two smaller arteries passing downward the red color was replaced in parts by irregular segments of the same white appearance; and there were some smaller patches on one of the large veins. On this dead white ground were scattered numerous scintillating specks, which looked like crystals of cholesterine. (Fig. II.)

DISCUSSION.

DR. NORRIS.—I have had an opportunity of examining this remarkable case, and I can bear witness to the accuracy of the picture. The appearances were absolutely limited to the distribution of the retinal vessels.

SOME MEDICO-LEGAL CASES UNDER STATE AND NATIONAL LAWS.

BY B. JOY JEFFRIES, M.D.,
BOSTON.

IN the Massachusetts Statutes, Chap. 194, as amended, is an Act relative to the employment by Railroad Companies of persons affected with Defective Sight or Color-Blindness, which reads as follows:

SECT. 1. No railroad company shall employ or keep in its employment any person in a position which requires him to distinguish form or color signals, unless such person has been examined for color-blindness or other defective sight, by some competent person employed and paid by the railroad company, and has received a certificate that he is not disqualified for such position by color-blindness or other defective sight.

SECT. 2. A railroad company shall be liable to a fine of one hundred dollars for each violation of the preceding section.

The Act went in force July 1, 1881. Its wording was designedly made so as to defeat the purpose of a law protective to stockholder, employé and the community. It is practically as dead a letter as the liquor laws, as I recognized that it would be when passed.

In my Infirmary and private practice, cases quite frequently occur illustrating the truth of the above statement. Many more must naturally occur in the practice of my colleagues. Attention should be called to them. The following cases are typical of those I have records of. Any member of the Society is liable to be summoned in court as witness or expert in connection with such cases, and under the gravest circumstances.

As to the Form-sense.

No. 1.—A young man wants to go on to one of two railroads. Vision of right eye $= \frac{16}{200}$, of left eye normal with + D. 1.25, a lack of vision and a hypermetropia which should keep him from any position where glasses cannot be worn, which position he does not want. There is nothing to prevent "any competent examiner" giving him a certificate as engineer.

No. 2.—A fireman at work on a road and desiring promotion to engineer, has converging strabismus. In right eye a hypermetropia of D. 2.50 and vision $= \frac{6}{18}$, in the left, squinting, eye Hm. = D. 2.50 and vision $= \frac{6}{36}$. There being no legal standard set and no expert appointed to detect the hypermetropia, this man has readily passed such test as his road made.

No. 3.—A brakeman has no certificate (the fine to the railroad for this is one hundred dollars). He has Hm. = D. 1.50, V. O.D. $= \frac{10}{20}$, O.S. $= \frac{20}{20}$; requires + D. 2.50 to read. Without glasses he could not read an order or a telegram.

No. 4.—A brakeman has been on a road some three years. Without glasses, V. O.D. $= \frac{6}{24}$, V. O.S. $= \frac{1}{60}$; V. O.D. with + D. 4.50 $= \frac{6}{12}$, V. O.S. with + D. 1.00 $= \frac{3}{60}$. The only test he had was the train despatcher asking him how many knobs there were on an adjacent telegraph pole, and telling him his vision was as good as any one on the road.

No. 5.—A brakeman has been on three roads, only tested on one. He has convergent strabismus, great pain and marked symptoms of cerebral trouble. Only pain and fright keep him from his duty, from which he just comes. No law requires him to be off duty.

No. 6.—A gateman applies to me for certificate for full pension for blindness contracted in the army. He groped his way into my office. He had white atrophy of optic nerve in each eye. He says at times he is completely blind in the sun, so he cannot see people on his crossing, which is an important one. He holds a certificate from his road examiner, "that he is not disqualified by defective sight."

No. 7.—An engineer comes from off his train with a foreign body on the cornea, requiring cocaine to remove, the "boys" having been at work on it. He refused atropine and cold

compress, which were needed, and went back to his train to run some fifty miles. There was nothing to prevent him in his wholly unfit condition. Interference would only have provoked abuse.

No. 8.—A similar case of a conductor, worse off, as it was before cocaine.

No. 9.—An engineer has vision without glasses, O.D. = $\frac{20}{40}$, O.S. = $\frac{20}{50}$; V. O.U. with + D. 1.25 = $\frac{20}{32}$. Not color-blind. He was 52 years old, and his sight too poor for his position. Another employé testing him, of course certifies to him.

No. 10.—A fireman, with vision normal and not color-blind, comes to be tested on his own idea, as he has never been tested or certified to by his road, where he has been some time. Road subject to one hundred dollars fine.

No. 11.—Engineer, 56 years old, brought by his superintendent, is not color-blind, has vision O.U. = $\frac{20}{50}$. The superintendent was frightened and took him off his engine. Under legal standard requirements and legal expert testing, this injustice could not have been done the man.

No. 12.—A conductor has lost his place on an employé's examination. He is quite hypermetropic, easily corrected by glasses, which there is no objection to his wearing. Another injustice from want of legal standards of requirement and testing. On learning my name his abuse was profuse, though all my efforts have been to prevent such injustice to employés. Office seekers had falsely misled him.

As to the Color-sense.

No. 1.—A gateman was turned off as color-blind. I found him only partially so. He never would have mistaken the lanterns in his hands. He had saved several lives at his crossing, was perfectly honest about his condition. The road examiner was afraid of certifying to him. Legal standards of color perception would have saved this injustice; but it would have required an expert to test and certify to his usefulness. I would not have passed him as engineer.

No. 2.—An engineer at work on a road I found perfectly color-blind. He was examined in the presence of the superin-

tendent and his brother employés. The superintendent had spent a good many hours going over with me the whole subject of defective vision practically, and declined to test his men himself. Neither he nor the employés would consent to this engineer being where he had to read colored signals. He was given a position in the shop, where he and the road made more money. His outside friends, who did not see the examination, carried him to another ophthalmic surgeon who, the superintendent told me, passed him as competent. This did not, however, affect the superintendent's decision, who said he would not employ him as engineer with any one's certificate. The certificate from the other surgeon would allow this dangerous man to be *legally* employed.

No. 3.—A brakeman or fireman whose turn came soon after this engineer (No. 2) made all the characteristic mistakes of a color-blind with the three Holmgren tests. He was quite convinced himself that he was color-blind, and resigned to rejection. The superintendent and the other employés were equally convinced from their own observations of the man's dangerous color-blindness. An experience with some thirty thousand examinations had, however, taught me, that whilst the man made the most thorough and characteristic mistakes of defective color-sense, he did not make them in the *way* the color-blind do. I first thought he was deceiving me and imitating the color-blind engineer preceding him. It proved that he *had* carefully watched and imitated him, not with the idea of deceiving, but because he supposed this engineer was right and all the normal eyed selections he had seen were defective. He would have been rejected on all other roads where no expert was employed; a legal injustice.

No. 4.—An engineer whom I found *incompletely* color-blind was doubted, and no certificate given him by his road (rendered liable to $100.00 fine), although he was allowed to run. An accident happening frightened the officials, and his "boss" was telegraphed to let no one out that night without a certificate. He having none was dropped. He would not have been under legal standards, from his term of service and success, or he could have been transferred to day work.

No. 5.—A master mechanic came to me for presbyopia and was found completely color-blind. His vision for form was remarkable, being equal to my own very nearly, $\frac{20}{8}$. He described his utter inability to read the colored signals, having often watched them on the track with his little boy who could tell them at once. As master mechanic he hired all employés who had to read color-signals, and his decision would be final. This would be perfectly legal.

No. 6.—An engineer is brought me by his superintendent and master mechanic. He was completely color-blind, even under such practical tests as they asked for. Till they had seen these a certificate from me would have induced them to keep him at his work, where he relied wholly on guess and his fireman. My certificate would have been entirely legal.

No. 7.—Another engineer brought at the same time was only a little less color-blind, and more dangerous on that very account.

No. 8.—A conductor from same road applied to me for certificate. He was completely color-blind. My certificate of usefulness would have reinstated him or placed him on another road, had I given one.

I could not blame some of these and other employés who have been to me offering me the very heavy fees they did for a certificate. And I should have sympathy with a half-starved struggling physician yielding to the pecuniary pressure. It should be legally impossible by state laws or corporation regulations. Standard requirements and competent expert examiners can alone insure honesty and fairness to all concerned.

UNDER NATIONAL LAWS.

The form-sense and the color-sense of officers and men entering the U. S. Army and Navy are tested, and a certain standard is required as to the visual power. For the navy and naval academy the restriction is naturally greater as to defective color-sense. So many cases of myopia, hypermetropia and color-blindness have been before me in those desiring to enter army or navy that I wrote a letter on the subject to our local medical journal and sent an extra to our

members. As it may not have been received, or thrown aside, I repeat it here: .

[From the Boston Medical and Surgical Journal, April 29, 1886.]

PHYSICAL EXAMINATION OF CANDIDATES FOR THE UNITED STATES NAVAL AND MILITARY ACADEMIES.

MR. EDITOR,—Members of Congress when having the right of nomination in their districts generally ask some physician to examine the young men who apply for the position. Such examination includes that of the visual power and color-sense of the candidate. As only a certain amount of hypermetropia or of myopia will be passed by the United States medical examining boards and no degree of color-blindness by the naval medical board, it is pretty important that defective vision for form or color should be detected by the doctor certifying to the young man's physical condition.

It is more than mortifying to young men, who pass an excellent examination, to be afterwards thrown out for physical defects. Cases have applied to me, and I have heard of others, of excessive myopia and color-blindness, when months were wasted in preparing for the ordeal, If the physician originally applied to cannot be sure of the degree of hypermetropia or myopia, it certainly would be better to send candidates to the nearest ophthalmic surgeon who can decide, than to have the young man rejected by the medical board afterwards.

Defects of the color-sense may readily escape detection by methods of testing ordinarily used, as asking the names of colors, etc. The surest means is to apply Professor Holmgren's test with the worsteds, as will be done to the candidates by the medical board. They, however, will have a proper collection of worsteds, but exactly the same can be procured of N. D. Whitney & Co., 129 Tremont Street, Boston, with whom I arranged to keep on hand type collections, at the request of the American Ophthalmological Society.

Physicians have written to me from different parts of the country complaining of their utter inability to apply Holmgren's test as described in my manual. On investigation I have found that they did not have a proper set of worsteds, but some of the imitations advertised and sold in New York and Philadelphia. An examination of these imitations showed that they could not possibly be used to properly carry out Holmgren's test. I hasten to say that I have no pecuniary interest in Mr. Whitney's sale of worsteds. I am desirous that the now necessary application of Holmgren's brilliant invention should not be interfered with by tradesmen's ignorance or cupidity, and that physicians should not be imposed on.

Yours truly, B. JOY JEFFRIES, M.D.

15 CHESTNUT ST., BOSTON,
April 20, 1886.

The report of an international signal commission, awaited by other maritime nations, can under present conditions and recent acts of Congress be made at once applicable and enforced. Only such can possibly contend against outside pressure and neglected duty in the interest of the dangerously defective.

No. 1.—A young man has passed a physician's inspection, goes up for examination for West Point, passes mentally brilliantly, but is rejected for vision only one-fourth, from myopia, likely to increase. This my testing confirmed. The loss of time and mortification were needlessly incurred.

No. 2.—A very parallel case came in a would-be naval cadet.

No. 3.—I was applied to by a young man who had passed an excellent mental and physical examination to enter the naval academy, with the exception that the medical board rejected him as color-blind. A special order of the Secretary of the Navy granted him another color examination. He purchased a set of Holmgren's worsteds, my color chart for educating the normal color-sense in the schools, and finally wrote me that his mother had cured him by education. I have do doubt that *outside pressure* might put him into Annapolis against the medical board's protest. The agreements made by an international signal commission would alone prevent any such pressure. It would force medical officers to be more certain by being more thoroughly posted, and render their decision final.

No. 4.—A naval officer completely color-blind has gone on the *black* retired list, from lack of international standards to protect him.

In the revenue marine, officers and men are tested and some standard applied under the marine hospital service. In the merchant marine, masters, mates and seamen may be blind and color-blind; there is no law touching them. Pilots may be blind, and no test is required of their form perception. They are tested for color-blindness and rejected if the examining surgeon declares them defective, or allowed only day routes. If he says *partially* defective, the local inspectors of steam

vessels may pass them, no matter how dangerous they are, as proved. The adoption of the necessary report of an international signal commission can alone insure the requisite knowledge on the part of the medical officers and prevent any and all interference with their decision, which decision would be guided by internationally agreed standards, etc.

No. 1.—The results of the examination of a pilot are referred to me from Washington for decision. The report of the medical board, etc. I reply, that without personal examination of the candidate I could not fairly decide. The officers could have been readily taught so as not to have been in doubt. It must, however, be remembered that every sort of outside and inside pressure has been employed to prevent any examinations or rejections by medical officers.

No. 2.—A captain who desired a pilot's license was declared color-blind by the marine hospital surgeon. The local inspectors doubted it and advised appeal to me. I found he had normal form and color-sense. As I had induced the law, and he was my patient, I felt it my special duty to have him get his license. Upon proper inquiry I found that the medical man was an acting surgeon awaiting promotion, who had not studied my manual placed by the government in his hands and had a poor and insufficient collection of worsteds, which he did not realize. He had fallen into the usual error of *asking the man the names of colors*, and got him as mixed as himself. I reported the case to Washington, it was referred to other marine hospital surgeons to consult with me, and I readily showed the mistake, and the man soon had a pilot's license.

No. 3.—A captain acted as pilot on an important route. When the law was enforced the marine hospital surgeon found him completely color-blind, and he was rejected. All sorts of pressure was made, as in other cases. He appealed to the Treasury Department over the Inspectors, and the following letter is printed in their report:

TREASURY DEPARTMENT, NOVEMBER 5, 1880.

SIR,—The Department has received your letter of the 28th, in which you ask that having been rejected in your examination for a pilot's license on account of color-blindness, you may be accorded

a second examination by the local inspectors. In reply, you are informed that if your case comes within the provisions of Department Circular, No. 46, 1880, a copy of which is herewith enclosed, you are entitled to appear before the local inspectors at Boston for re-examination without appeal to the Department. Otherwise, the Department is not disposed to make further modification of the regulations upon this subject. Very Respectfully,

J. H. UPTON,
Acting Sec.

In order to yield to the outside pressure and prevent the discharge or refusal of color-blind pilots, a rule was made that if the surgeon said the man was *partially* color-blind he could be referred to the local inspectors. These always passed him, their tests being as silly as ignorant.

A patient of mine who was a friend of this pilot, after his appeal, etc., brought him to me, and the very practical tests applied quickly induced the friend to advise the pilot to give it up. This the pilot could not see. Some three years afterwards the former employer of this pilot brought him to me again to test. I explained his case, the department action, etc., but was met by the exhibition of his license in due form. This his employer did not care for, but wanted personally to see what was the trouble, etc., as he would run no risk on his steamers. The same practical tests, such as a colored side light held in the sun six feet before the pilot's face and not recognized, soon convinced the employer as it had the friend. On inquiry I found another marine hospital surgeon had tested the pilot and called him *partially* color-blind, which enabled the inspectors to pass him by *their tests*. They did not even limit him to day work. Their records give him a full license. Comment is hardly necessary. How many more are there?

The Society will recognize that any of these cases might have come under their observation, and *that* under the gravest conditions of danger to life and property. I would recommend caution and attention.

A NEW SERIES OF METRIC TEST-LETTERS AND WORDS FOR DETERMINING THE AMOUNT AND RANGE OF ACCOMMODATION.

By CHARLES A. OLIVER, M.D.,
PHILADELPHIA.

THE accompanying card of reading test-letters, which has been based upon the same plan as the sheet of Metric test-letters,[1] presented to the Society at its last Annual Meeting, is offered for the following reasons:

First,—The Letter. The usual forms of Roman and Italic types, which have heretofore been employed in the ordinarily used reading tests, have been discarded. The same Snellen basis of block-letter formation that was used in the first series of letters has been accurately preserved in this, thus giving the proper visual angle for every letter and its component parts throughout the whole system of lettering. This is of great advantage, as it thereby places the obtainment and registration of the amount and range of accommodation upon the same basis as the determination of the acuity of vision, thus allowing perfect uniformity of result in the two modes of examination.

Second,—The Character and the Arrangement of the Words. The seven letters C D E T O L F have been made into words of one or two syllables each. These letters have been chosen because they are deemed the only ones of a formation that accurately complies with the five-minute and one-minute visual angle system of Snellen. Forty-nine words have been obtained, and are arranged into columns. Each column contains a word composed either entirely or in majority of horizontal and vertical strokes, followed by a word formed of a preponderance of curved ones; each successive column begin-

ning alternately with one of the two varieties. This plan gives a system of working, in which one word made of lines running mainly at ninety degrees and one hundred and eighty degrees, is in every instance followed by a word made of a majority of curved lines, no matter in what vertical or horizontal direction the columns may be read; thus making every word a valuable aid in the detection of astigmatism. Every size of type is so arranged that a new order of columns is presented to view, so as to prevent any error that might arise from memorizing; the words following each other in such an order that nothing can be remembered from context.

Third,—The Sequence. The smallest type is placed first, and each successive size is situated beneath in regular order, until one equivalent to two dioptrys is reached. This large type finishes the card, which leaves a separation of but one-half dioptry between this card and the large one.

Fourth,—The Interspace. Each word and each letter is surrounded by a space equal to or greater than its own area. This has been done by separating every letter by an area equivalent to its own, and by making the intervening widths between the columns of the same sized type equal to or greater than the horizontal spaces occupied by the words themselves. This plan keeps every letter and word separate, and renders them not liable to be confounded with any of their neighbors.

Fifth,—The Gradation. The following sizes have been chosen: 0.25 D., 0.50 D., 0.75 D., 1. D., 1.50 D., and 2. D., as they represent all the necessary gradations before reaching the first sized type (2.50 D.) upon the large card.

Sixth,—The Construction. The same method of manufacture has been pursued in obtaining the size of letters and the printing of the type as was explained in the previous paper. The card itself is made of heavy cardboard, and has rounded corners so as to prevent breakage. It has been covered by neutral-gray colored paper, in order to hide, for a time at least, the finger marks which render the ordinary sheet of reading types so dirty. The letters are printed upon a sunken surface in the centre of the card, thus keeping them entirely free from all contact by handling or by being placed upon dirty

[illegible] 50

[illegible] 75

FEE FOOD ELF ODD DELL COOL LEFT
OLD LEET COO EEL COOT FEET COLD
ELL COLT LET ODE FEED DOLE FEEL
TOD TOLL COD LEE TOOL FELL DOFF
LOT DOTE FED TOO CELT CLOD TELL
LOO LOFT DOT FOE FOOL DEFT LODE
OFF FOLD TOE COT LOLL TOLD FELT

LEFT ODD DELL COOL ELF FOOD
COLD EEL COOT FEET COO LEET
FEEL ODE FEED DOLE LET COLT
DOFF LEE TOOL FELL COD TOLL

DELL COOL FEE FOOD
COOT FEET OLD LEET
FEED DOLE ELL COLT
TOOL FELL TOD TOLL

ELF FOOD LEFT
COO LEET COLD
LET COLT FEEL
COD TOLL DOFF

surfaces. The frame-like margin has been made broad in order to allow greater freedom in use.

It may be safely claimed that this is the only set of reading types which has been made upon the same scientific basis that governs the types used in determining visual acuity, and therefore, by reason of this conformity, an examination of acuteness of vision and the determination of accommodative action by means of these two series, serve to place the results upon a uniform and proper foundation.

It is presented in the hopes that the advantages it may possess, shall make it of sufficient determinate value to be placed amongst the ordinary working materials required in ophthalmic practice.

James W. Queen and Co., of No. 924 Chestnut Street, Philadelphia, have kindly superintended the construction of the cards, and to them the author here desires to express his thanks for careful and satisfactory work.

ON THE POSSIBLE RETARDATION OF RETINITIS PIGMENTOSA.

BY HASKET DERBY, M.D.,

BOSTON.

"PIGMENT degeneration of the retina is, as a rule, incurable; leading, despite all efforts in the way of treatment, to a steady decrease in vision, and entire blindness. Abstraction of blood, various derivatives, mercury, iodide of potash, iron, subcutaneous injections of strychnia, and the constant current are alike unavailing." [1]

Thus wrote Leber in 1877. And in 1879 Zehender says, alluding to the effect of some of the remedies above mentioned, "The fact is that temporary improvement in central vision has sometimes been observed to follow the use of such treat-

[1] Graefe-Saemisch, V. d. V. p. 752.

ment: but in no case was the improvement long maintained; and in no case, and through no remedy, has there resulted an even transitory improvement in excentric vision; an enlargement of the contracted visual field." [1]

"Even temporary improvement," says Klein, writing the same year, "is produced by no known treatment." [2]

In 1884 Michel states "treatment is useless, save in syphilitic cases." [3]

Cases of retinitis pigmentosa occur, in American practice, with comparative infrequency. Among nearly thirteen thousand patients I have met the disease but twenty-seven times; giving a percentage of but 0.2. So restricted is therefore the experience of any individual practitioner, that any questions arising as to the probable course of the affection, in a given case, would be answered by reference to such authorities as I have just quoted. To the inquiry as to whether the use of such eyes may be permitted for purposes of study, no response whatever could be given; while that regarding possible treatment would be met by an unqualified negation.

In May, 1881, a boy aged three was brought to me from Western Virginia. For the past fifteen months the parents had observed that his vision seemed to grow imperfect as the day began to decline, and became much more so at night. He was a healthy, bright-looking child; but restless, and hard to examine. The ophthalmoscope was used with much difficulty, and seemed to reveal nothing. Central vision of course could not be estimated. There was no blood relationship on the part of the parents, and no history of blindness in the family.

In January, 1886, five years later, he came again accompanied by his sister, fifteen months younger than he: the lad being now eight years old and his sister about seven. Each of the children was night-blind, and each presented the usual ophthalmoscopic appearances of retinitis pigmentosa. The boy had vision, right, 0.2; left, a little less than 0.2; the girl

[1] Zehender. Lehrbuch der Augenheilkunde, p. 366.

[2] [illegible] p. 448.

[3] [illegible] p. [illegible].

nearly 0.4 in each eye. In either case each visual field was of fair size, but unmistakably contracted from the normal, especially above and below.

In this connection I would call attention to the fact that the disease, in the boy's case, began to show itself before he was two years old; thus proving the untrustworthiness of the statement[1] that symptoms have never yet been manifested before the sixth year.

The two questions that form the subject of this paper were at once put me by the parents. How should these children be educated, and could they be treated?

As regards the latter my answer, according to the authorities quoted, should have been in the negative. But I happened to remember some cases reported in the year 1873 by Dor,[2] where the steady use of the constant current had produced a notable increase in the size of the visual field, as well as improvement in central vision, in three cases of retinitis pigmentosa. And in 1881, a paper[3] was published by Mr. Gunn "On the continuous electrical current as a therapeutical agent in atrophy of the optic nerve, and in retinitis pigmentosa." He gives four cases of the latter disease in which this treatment was used, with notes of the improvement both of central vision, and of the visual field, in three. In two of these cases diagrams of the original and increased field are given. Mr. Gunn's theory of the action of the current is that it increases the conductivity of the optic nerve, and possibly temporarily dilates the retinal blood-vessels.

It is singular how little attention these observations have excited. Both Professor Dor and Mr. Gunn write now that they continue the use of the constant current in these cases. The former asserts that he obtains "either a constant and progressing amelioration, or at least a prevention of the natural increase of the disease." Mr. Gunn writes (June 14, 1886), "I have followed only one case of those I then published, and there the improvement has been, or rather was, when last

[1] Klein, l. c. p. 443.

[2] A. f. O. XIX. 3. p. 342.

[illegible]

seen, permanent." He adds, however, his impression that this permanence will not continue; though the natural course of the disease would be delayed.

These children who were brought me this spring were taken from their studies during the early part of the treatment. For three months the constant current was applied three times a week, five minutes at a time; six to eight cells of a Stœhrer battery being employed. The electrodes were most of the time placed on the temples, but occasionally above, and even on, the eye.

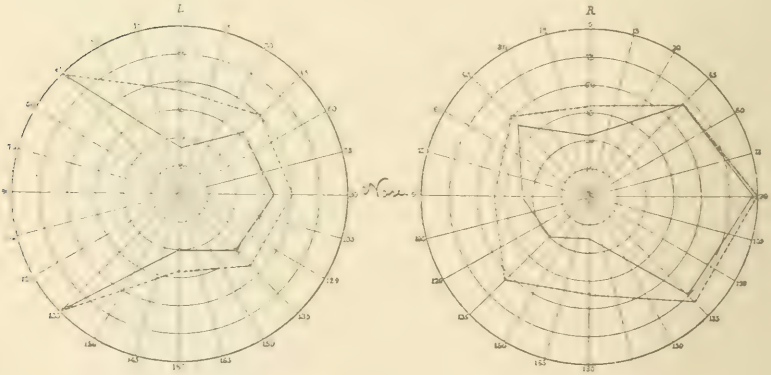
At the end of three months central vision was as follows:

In the case of the boy, right 0.3, nearly.
left 0.2;

thus showing very little change.

In the case of the girl, right 0.6, nearly.
left 0.6, "

I.—Boy.

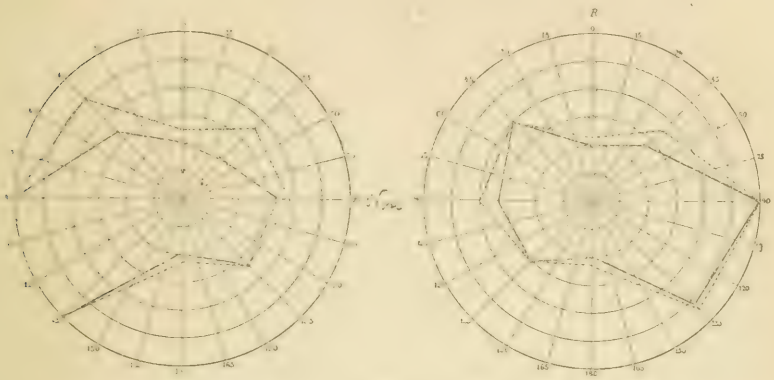


Jan. 8, 1886, ——— Apr. 16, 1886, - - - - - - - - -

In either case there had been a decided improvement, according to the father, in the night-blindness; and as marked an increase in the size of each visual field. This is illustrated by diagrams I. and II. Measurements were made every three weeks, but the first and last are alone represented.

These results were reported in the spring to the New England Ophthalmological Society, and Dr. Standish has since kindly furnished me with the notes of a case treated by him in the same manner.

II.—Girl.

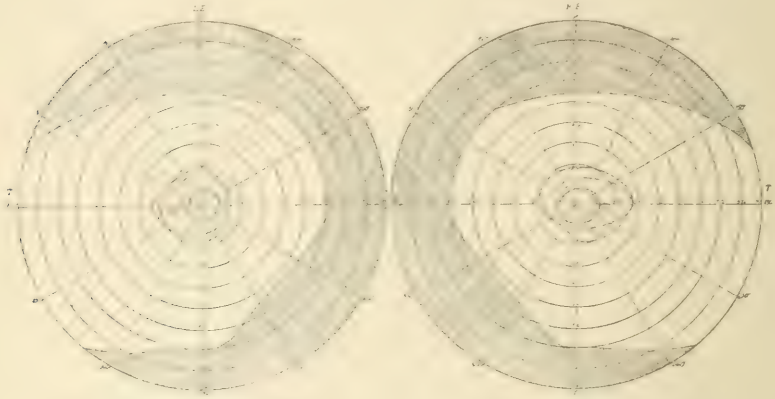


Jan. 6, 1885, ——— Mar. 18, 1886, - - - - - - - - - -

April 14, 1886.—"Miss K. M., thirty-three years of age. Has worn glasses since she was seventeen years of age. Three months ago began to experience difficulty in going about after dark. Had noticed for several years that she did not see as well as others in the evening. Parents not related. Patient is the only child of her father's first marriage. Has several half-brothers and sisters who have never had any trouble with their eyes. In her mother's family several members were near-sighted. Vision, right, $\frac{12}{40}$: left $\frac{12}{50}$. The ophthalmoscope showed a number of characteristic star-shaped spots of retinitis pigmentosa in the periphery of the fundus of each eye. Constant current was used, once in eight days, for five minutes to each eye; the positive pole being applied to the closed eyelids. No other treatment was used. Each field enlarged, as will be seen by diagram III.; and the central vision increased, right, from $\frac{12}{40}$ to $\frac{12}{30}$; and left, from $\frac{12}{50}$ to $\frac{12}{30}$. Patient stated, on the occasion when the last field of vision was taken, that she was then able to tell the time by a tower clock, visible from her chamber window, and that for nearly a year previous to treatment she had been unable to do this."

As Mr. Gunn very justly observes, the previous association of galvanism with charlatanism creates an instinctive prejudice against its employment, more especially in a disease which it has been customary to pronounce hopeless. But if the otherwise sure progress of retinitis pigmentosa can be merely

III.



Apr. 14. May 10. June 26.

delayed; if the fatal ending can be deferred, and a certain amount of useful vision protracted, this treatment should be employed in every case. At all events, information on the subject should be carefully collected. Inclusive of those here presented, but ten cases of the use of the constant current, in this connection, have yet been reported. And the writer of this paper trusts that its lack of originality may be atoned for by the attention it seeks to attract anew to this subject.

But another object remains to be attained. What course is to be pursued with reference to the education of those in whom retinitis pigmentosa is diagnosed in early childhood? Shall they be kept from all use of the eyes on near objects? Shall moderate and frequently interrupted study be permitted? Or shall no attention be paid to the presence of the disease, and the education proceeded with as though nothing were the matter? Such are the questions proposed to me by the parents of these children. Our books give absolutely no suggestions on the subject. I appeal therefore to the experi-

ence of members of this Society. Have they followed any cases long enough to have formed an opinion?

So long as retinitis pigmentosa was looked upon as a disease incapable of being influenced as to its course or result, there seemed no reason why its victims should not get all the profit and enjoyment possible out of life, and employ the years during which sight remained to them in gaining all the education they could. But, with the possibility of retarding the progress by treatment, comes the opportunity of a properly directed hygiene. Is it unreasonable to suppose therefore that vision would fail less rapidly if the eyes are used sparingly for the purposes of study?

The following case seems to me to bear on this question.

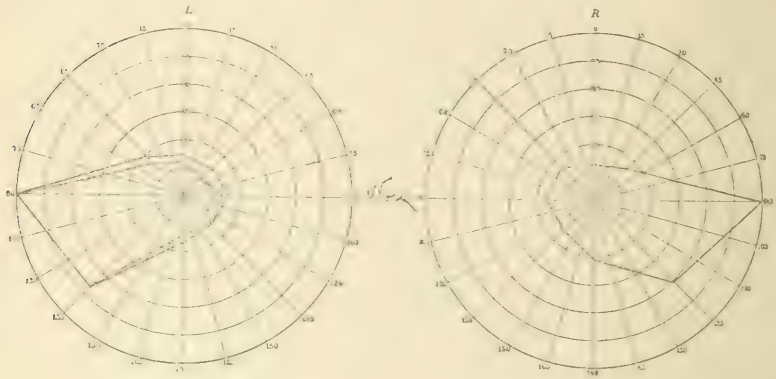
G. B. W., a lad of fourteen, came to me in July, 1881. The case was a typical one of retinitis pigmentosa, the pigment deposit being unusually profuse, the nerves muddy and the vessels small. Central vision in each eye 0.3. Each field greatly contracted. Physical condition perfect. The mother's sight was excellent. The father had posterior polar cataract in the right eye, divergent strabismus of the left. There were three other children, all of whom had divergent strabismus, but none any pigment deposits. Parents not related, but grandparents, on the father's side, were first cousins.

I advised non-use of the eyes for the present, and a course of electricity. The patient made but a short call, and promised to return for the purpose of allowing me to take a chart of each visual field, but failed to do so. He subsequently consulted two colleagues, one in Boston and one in New York, each of whom advised him to use his eyes freely. Acting on this he has gone through a course of study preparing him for admission to the Institute of Technology, which he proposes to enter this fall.

I saw him again in March, 1886. Vision, right 0.1; left, less than 0.2. Each visual field as in diagram IV. July 11th, vision of the left eye had fallen off to 0.1, and the field slightly contracted. He was sensible that he was rapidly becoming more "near-sighted," as he expressed it, and was observed to grope about for a door-handle, by daylight, the light being fairly good.

This case proves nothing. But it shows, under full study, what must be admitted to be an unusually rapid progress of the disease in a lad of nineteen. I cannot but think that, had my suggestions in 1881 been followed, his present condition would have been less deplorable.

IV.



Mar. 29, 1886. — July 10, 1886, - - - - - - - - -

DISCUSSION.

DR. LITTLE.—In 1877 I saw a case bearing upon this interesting paper. It was a case of retinitis pigmentosa in a deaf-mute. I saw the case in October, 1877. Right eye, V. = $\frac{20}{100}$; left eye, V. = $\frac{20}{70}$. There was a syphilitic history in this case. The study of the fields of vision was very difficult, he being a deaf-mute, but I do not think that there was any large amount of restriction. The point to which I desire to particularly refer is the influence of electricity in this case. I did not employ the constant, but the interrupted current. After two or three applications of the Faradaic current, the right eye gave V. = $\frac{20}{40}$; left eye, V. = $\frac{20}{30}$. The mixed treatment was also employed. In January, 1878, right eye gave V. = $\frac{20}{40}$; left eye, V. = $\frac{20}{25}$. There was a large opacity in the vitreous of the right eye. This opacity diminished under the use of the current. In April, 1878, right eye, V. = $\frac{20}{30}$; left eye, V. = $\frac{20}{20}$. In July, 1879, the same result was obtained. The young man then went on a ranche. In 1883 he was doing well, but did not see as well at night as before. The hearing also improved under treatment, from mere contact with the watch to two or three inches from the ear.

There is another condition which I have seen in the eyes of a patient at the Jefferson College eye clinic, in which the pigmentation had proceeded so far that the vitreous masses were also black. This I had never seen before. There was consanguinity in this case.

Dr. Fox.—I have had an opportunity of treating a number of cases successfully. In my observations, I have found that it was the negative pole that produced good results. I also found that if, after three applications, there was no enlargement of the visual field and central vision was not improved, improvement would not take place. In one case, after discontinuing the treatment for eight months the improvement was still manifest. There was no retrogression of vision. In quite a number of these cases, in fact in all where the field of vision was enlarged, the blood-vessels seemed to increase in calibre and the night-blindness correspondingly diminished.

Dr. Harlan.—Within the past few weeks, I have been called upon to decide this question, whether or not the patient should use the eyes. It was the case of a boy of seventeen in whom the vision was failing quite rapidly. A sister, a few years older, had the same history. She had got along well with her school work until the age of about sixteen years, when she was obliged to give up. My faith in any plan of treatment being very weak, I advised that they should get as much good as they could out of the eyes while sight lasted. From the cases which I have seen, I think that there is likely to be a culmination of the disease about puberty. Out of a series of nine cases which I reported some years ago as the result of an examination of the inmates of a blind asylum, this was the case in four. It was the case in the two I have mentioned.

As regards the occurrence of the affection before the age of six years, I have the records of two cases in which it evidently was congenital. One was W. G., aged twenty-one, born blind; with slight perception of light, pupils contracted and pigment spots marked. The other was J. C., aged 19, has never seen better than at present. The pigment spots are marked, and there is peripheral contraction of the visual field.

Dr. Strawbridge.—I should like to say a word with reference to the use of the electric current in the treatment of retinitis pigmentosa. I went over this subject ten years ago, and thoroughly tried electricity for several years. I never benefited a single case, and in some cases I think I did harm. The currents used were of moderate strength. There is a

certain number of cases where there is a weak nerve, where the stimulation by electricity is followed by exhaustion of the nerve and it does not come up to its former condition. I noticed this in several cases.

I place more reliance in occasional treatment by alteratives, such as small doses of bichloride of mercury and iodide of potassium, looking on these cases as largely the result of syphilitic taint, probably dating long back. This was the practical result of my experiments. If I should use electricity again, I should be very cautious how strong the currents were.

DR. THEOBALD.—I have had no experience in the use of the constant current, but I have seen temporary improvement follow the use of phosphate of iron, with quinia and strychnia. I have had one or two cases in which there was appreciable improvement, central vision becoming better than before treatment was instituted. One of these patients who was under my care when about eight years of age was seen within a few months. He is now a man, and retains sufficient vision to enable him to perform his duties as a travelling salesman. Recently there has been a slight decline in vision, and I have put him on the same course of treatment. There was no intermarriage in the case of the parents of this patient, but there was a history of trouble of a similar character in other members of the family.

DR. RISLEY.—In regard to the influence of treatment on the sharpness of sight and the field of vision in such cases, it seems to me that the adminstration of strychnia by hypodermic injection has produced marked improvement in some cases. As far as I know, it has never been permanent.

I have at present under observation two children, whose symptoms bear upon the point with reference to the age at which the disease appears. They were brought to me first several years ago. The oldest was between three and four years of age, when first seen. There was simply disturbance of sight, but the ophthalmoscope showed no pigment in the retina, but rather absorption of pigment. The child complained of headache and dreaded the light. In the course of the following year, pigment spots were seen in the periphery of the choroid. The President will recollect having seen the case within the past few months with a few pigment spots in the periphery.

When pigment was discovered, I directed that the younger child be brought to me. It was not two years of age. There was not the slightest disturbance of vision. There was the same unhealthy appearance of the eye grounds as seen in the

previous case, and the pigment had begun to be absorbed. The children have been brought from time to time, and within the past month the younger child has shown an evident increase in the trouble in the choroid and retina and the general disturbance of vision which was exhibited by the older child.

A young man with retinitis pigmentosa, with marked contraction of the field and asthenopia, partly depending on hypermetropic astigmatism, consulted me, and I put him on strychnia and bichloride of mercury, alternating with iodide of iron, etc. At the end of two years, there had been a very slight increase of the trouble. To relieve the asthenopia, I gave him a weak solution of eserine, which would simply contract the pupils without causing supra-orbital pain. Under its use, vision improved considerably. He has used eserine with more or less constancy for two years. He carries with him a weak solution, and when he is without it he is distinctly more uncomfortable.

Dr. Wadsworth.—I wish to speak of one case which bears upon the second point considered by Dr. Derby, *i. e.* the question of the advisability of cutting off work to save the eyes. It shows, in connection with the cases of rapid change reported, the variable course which the disease may pursue if left to itself. A young man, twenty-four years of age, a divinity student, was seen in 1873. He had typical retinitis pigmentosa so far as the ophthalmoscopic appearances were concerned. He had well marked night-blindness. The best vision, with -7, was $\frac{14}{100}$ in each eye. The field of vision was one and one-half inches in diameter at the distance of one foot. Yet he was studying German and Hebrew without trouble. He continued his work, and I saw him again eight years later. He had used his eyes freely, had graduated and had charge of a parish. His vision remained as before. The field of vision seemed to have narrowed, being not more than seven-eighths of an inch in diameter at one foot.

THE ELECTRIC LIGHT AS AN ILLUMINATOR. THE EFFECT OF STRONG LIGHT ON THE EYE.

By J. A. ANDREWS, M.D.,
NEW YORK.

THAT the exposure of the eye to an excess of light may be attended with harmful effect is a fact attested by the cases recorded in ophthalmic literature; and this subject has assumed a fresh practical importance since the application of electricity to lighting purposes.

Mackenzie, Jäger, Arlt, Dufour, Haab, Emmert, Sulzer, Simeon Snell, and others have recorded cases in which either retinitis or scotoma, or other visual disturbances, have resulted from exposure of the eyes to bright light.

Among twelve cases reported by Jäger as having resulted from looking at an eclipse, eight cases were without material change; in four cases there was choroiditis.

Arlt describes one case of chronic choroiditis produced by looking at the eclipse of July 28, 1851.[1]

Schirmer gives one case of positive central scotoma after blinding of retina by lamplight, the same having occurred before when the patient looked at the sun or glaring light. Ophthalmoscopic examination showed an "especially dark macula lutea;" otherwise the fundus was normal.[2]

Dufour[3] gives one case, evidently carefully observed. The whole macula lutea was taken up with a dark-brown pigmented spot, the centre of which formed a sharply defined yellowish-white patch. Vision was reduced to $\frac{1}{20}$ during twenty-two

[1] Krankheiten des Auges, Bd. iii. p. 127. Prag, 1856.

[2] Klin. Monatsbl. f. Augenheilk., 1861, p. 261.

[3] Bulletin de la Société Médicale de la Suisse romande, 1879, p. 267. See, also, by the same author, other cases of trouble to the eyes resulting from observing the eclipse of May 16 and 17, 1882.

days; the macula region was wholly normal. Vision was improved to $\frac{1}{2}$.

Haab[1] relates one case of central scotoma produced by observing the eclipse of the sun.

Emmert[2] gives one case. Vision reduced to $\frac{2}{10}$; fundus normal.

Simeon Snell (*Ophthalmic Review*, May, 1883, p. 141) records one case of retinitis, caused in a girl, aged twenty, by a "single flash from a sun reflector," in the hands of a boy. The eye was affected immediately; on the next day vision was = Jäger 20. In the neighborhood of the macula and optic disc there was cloudiness of retina. Perfect recovery.

D. Sulzer (*Klin. Monatsbl. f. Augenheilk.*, April, 1883, p. 129) relates four cases of retinal affection from direct observation of the eclipse of the sun of May 16, 1882. The symptoms were central scotoma, slight hyperæmia of the optic disc, exudative condition of the yellow spot, which, in one case, led to pigment degeneration in the region of the yellow spot.

H. R. Swanzy (*Ophthalmic Review*, May, 1883, p. 142) gives two cases of central amblyopia from exposure of the eye to the direct rays of the sun. There was in each case positive central scotoma, and metamorphopsia, and a positive flickering after-image, which latter symptom continued four months after the exposure. There was no visible change in fundus. Vision (previously normal) was $\frac{6}{18}$ in right eye. Read with slightly excentric fixation with right eye, owing to central scotoma, although examination in the usual way for central scotoma, either with blackboard or perimeter, gave a negative result, the conclusion being that the defect was extremely small. But the patient declared that he saw Snellen's smallest type with difficulty, owing to the black spot which came just over the word he wished to look at. These cases are also interesting as having occurred in two individuals —a coachman and his employer—from the same cause at the same time.

[1] Correspondenzblatt für Schweizer. Aerzte, 1882, p. 383.
[2] Revue Médicale de la Suisse romande, 1882, p. 395.

Deutschmann (*Von Graefe's Archiv*, vol. xxviii., 1883, p. 241) records four cases of damage to the eye, caused by watching the eclipse of the sun on May 17, 1882. Three of the patients had gazed at the sun with the naked eye; in the fourth case, a dark blue glass had been used. Every one of the four had noticed, immediately after gazing at the sun, a dark or semi-blind patch in the middle of the field of vision, and in each a small positive scotoma was found on examination; scotoma not absolute in any of the cases. Gradual improvement occurred in all, but absolutely perfect vision was not recovered in any case. The ophthalmoscope showed corresponding changes in all, viz.: in the cases seen early, a small, bright-white spot at the centre of the macula lutea, and around this a blood-red ring shading off into the normal color; in the older case (four months), an appearance less easily distinguishable from that of the normal eye, and similar to that which the other cases presented when recovery was nearly complete.

Under the caption "Neuroses of the Visual Nerve-apparatus, caused by the Continuous Action of Bright Light," M. Reich (*Von Graefe's Archiv*, vol. xxvi. 3, 1880, p. 135) described an epidemic of snow-blindness which occurred among a body of laborers engaged in clearing a way through masses of snow which obstructed the road between Passanaur and Mleti, in the Caucasus. The rays of the sun, reflected from the vast stretches of snow on every side, produced an intense glare of light, which the unaccustomed eye could not support without the protection of dark glasses. A few of the sturdiest among the laborers were able to work with impunity, but the majority, and especially the weakly and anæmic, suffered severely in their eyes, in spite of various devices to protect them from the light. Among seventy strongly marked cases, thirty were so severe that the men were absolutely unable to continue their work or to find their way home. They were collected in a covered place, where Reich found them, on his arrival, prone on their faces, striving to hide their eyes from the light, and crying out from pain. Photophobia was present in all the cases. Hyperæmia of the conjunctiva, with more or less injection of the ciliary vessels, and even chemosis, was found

in all the severe cases; those with chemosis complaining the most of pain. Cornea not affected in any case. The pain, generally of a cutting character, did not cease in darkness. Strong *contraction* of the *pupils* in all cases, except two, in which they were *dilated*, and in these two cases there seemed to be some degree of retinal anæsthesia and contraction of the visual field; the ophthalmoscope showed capillary hyperæmia of the optic discs and some over-fulness of the retinal arteries and veins; ciliary injection and chemosis were present in both cases, and the eyeball tension appeared to be somewhat increased. Recovery was gradual, but complete, in all cases. The author declared that the impairment of vision was not of the nature either of hemeralopia, or nyctalopia, meaning by the latter the condition in which vision is persistently defective in ordinary light, but improved in diminished light. The conjunctival hyperæmia, which played a very unimportant part in the affection, is referred by the author to reflex dilatation of vessels through the action of light. W. C. Rockliffe (*Ophthalmic Review*, September, 1882, p. 308) records a case of acute conjunctivitis which he referred to the action of the *electric light*, the patient having been engaged in adjusting the carbon points of a Siemen's electric lamp of *three-thousand-candle power*, which he did without colored spectacles. The patient had noticed on other occasions that, on descending the ladder, after adjusting the carbon points, and a short exposure, in close proximity to this very intense light, that he was unable to perceive the people on the street, but that this effect soon passed off. On a particular occasion, as his power of vision returned (in about fifteen minutes), there followed a rapidly increasing lachrymation, photophobia, pain, and swelling of the lids, the whole of these symptoms having been developed in thirty minutes. Rockliffe describes the lids of both eyes as having been very hot, red, swollen, and brawny, and as being on a level with the superciliary ridge, the swelling extending some distance below the brow. The pain was most acute in and around the eye. The conjunctival vessels were exceedingly large, and the eyelids and the eyeballs were a brilliant scarlet. The corneæ were clear. All of these

symptoms yielded to a brisk purge and a lead lotion in forty-eight hours. His fellow-workman was similarly affected, but to a less degree.

A. Emrys-Jones (*Ophthalmic Review*, April, 1883, p. 106) records the case of a person engaged in experimental work with the arc electric light, which necessitated his gazing intently with the naked eye at the LIGHT, from a distance of a *few inches*. As there was no inconvenience at the time, and as the longer he looked the more accustomed his eye became to the light, he continued his observations for *twenty minutes*. The next morning he awoke with intense pain in the eyes, and profuse lachrymation and photophobia; also slight redness of the conjunctiva, but no swelling of the eyelids. A drop of atropine instilled into the eyes gave instant relief, and as soon as the physiological effects of the atropine had passed off the patient was able to resume his work. Jones also adds a description, written by the patient himself, who had a great deal to do with electric lighting, in which he speaks of the effect of the light on the eyes of persons engaged in working in close proximity to the light (*arc light*). In the worst cases, which generally arise from adjusting the lamp (*two-thousand-candle power*) while burning, without goggles or smoked glass, the distance of the eyes would average eighteen to twenty-four inches, and with weak eyes *one minute* will produce certain inflammation (?). He thinks that much depends on the nature of the light, as he found that either an excess of current, which produces a violet light, or a defect of current, which gives an orange light, is less injurious than the normal (white, tinged with a sky-blue) light. David Little (*Ophthalmic Review*, July, 1883, p. 197) speaks of a case of retinitis occurring in a gentleman, engaged in scientific experiments with the electric light, who had neglected, on one occasion, to put on his dark spectacles while thus operating; the box containing the electric light was suddenly opened, and the light fell upon his *right* eye. It was a great shock to him, and he was blinded for several minutes; his eyes were very intolerant of light for several days afterward, and he suffered a great deal from headache. Two months after the accident

he consulted Dr. Little on account of a mist and dark specks before his *right* eye, which had existed since the accident. Vision of right eye $= \frac{20}{50}$; the vision of the left eye was good, and the fundus was normal. There was haziness over the right optic disc and the retina immediately around it.

Eye-affections caused by lightning have been classed in the same category with those ocular disturbances caused by exposure of the eye to strong light, partly, perhaps, because in the older text-books the intense light of lightning was assumed to be the chief agent; but the intensity and duration of lightning are not sufficient, and the lesion so produced does not at all correspond with that produced by lightning, since the scotoma produced by exposure to bright light, as recorded in literature, has been of limited extent, instead of affecting the entire field as in the case of lightning. Moreover, it is impossible to ascribe to the action of light the associated nerve-lesions, or the structural changes in the choroid and lens, which obviously are caused by lightning. That light, under certain conditions, is capable of producing opacification of the crystalline lens—one of the prominent ocular lesions caused by lightning—has been demonstrated by Czerny, who showed that the direct rays of the sun, condensed by a lens, will produce in the eye of the rabbit an opacity of the crystalline lens in about a quarter of a minute, by coagulation of albumen; but this can hardly afford an adequate explanation of the production of cataract by lightning, for, apart from the less intense brilliancy of a lightning-flash as compared with the concentrated sunlight, the duration of the former is much less than a quarter of a minute. Leber (*Von Graefe's Archiv*, vol. xxviii. p. 255), who has given a comprehensive analysis of all that is at present known of ocular injuries caused by lightning, rejects the idea of any mechanical production of the opacification of the lens, and attributes it to a "direct *physico-chemical action* of the electricity on the lens substance, by which its albumen is coagulated;" but Leber does not refer this coagulation to heat alone, for it can readily be shown that a higher and more enduring degree of heat would be required than can reach the lens during the lightning-flash, nor was there any

external sign of scorching of the eyes in those cases in which cataract was produced by lightning; hence Leber regards the coagulation of albumen to be a kind of catalytic action, as compared with the curdling of milk which occurs during a thunderstorm. Leber further suggests that this catalytic action is not confined to the lens, but would probably be discoverable as an opacity in many other structures, were they transparent. The opacity of the lens in these cases is said to be permanent, and the non-vascularity of the lens may furnish an adequate explanation of the permanence of the lesion in this body. This is certainly a reasonable hypothesis, but it does not necessarily exclude the probability of a mechanical injury to the lens, simply because the capsule of this body remains undisturbed, any more than the rupture of the choroid, and hæmorrhage from the choroid and retina, and partial detachment of the retina, which are also known to occur from the shock without the patient being struck by the lightning, and without rupture of the external tissues. Thus we see intense light is not the chief agent in an electrical explosion in producing the eye-affection.

There is another class of cases which may be considered in connection with this subject, viz., the opacity of the lens occurring among glass-blowers, in whom the intense radiant heat to which their faces are exposed (148° Fahrenheit) seems to be the chief agent in producing this condition; but I have not found cataract so common among the glass-blowers whom I have examined—284 in all—4.5 per cent. showing lenticular opacities among 65 men under thirty-eight years of age, and twenty per cent. among those men who were over forty years of age. Meyhoefer (*Klin. Monatsblätter f. Augenheilk.*, February, 1886, p. 49) found among 506 glass-blowers just the double of my percentage among those men under forty years of age. I did not find any lesion of the fundus of the eye which could be referred to the occupation as a cause.

In the first class of cases of eye trouble alluded to above, as resulting from exposure of the eyes to direct sunlight, it appears that lesions are produced which are identical to those found by Deutschmann in the retina of rabbits when the

direct rays of the sun, condensed by a concave mirror, and then rendered parallel by a convex lens, are caused to enter the dilated pupil. After exposure for only a few seconds the ophthalmoscope revealed a silvery-white patch surrounded by a dark-brown ring in the retina. The microscope showed that the material changes consisted in an actual disorganization of a limited area of the retina by coagulation of the albumen in its tissue, and beneath and around this a vascular reaction in the choroid, leading to hyperæmia, exudation, diapedesis of blood-corpuscles, and pigment disturbance. It will be observed by referring to the cases recorded by Arlt, Schirmer, Dufour, Haab, Emmert, and others, of visual disturbance caused by exposure of the eye to direct sunlight, that in the majority of instances there was no demonstrable lesion in the fundus oculi; nor is the evidence as to the causation quite satisfactory when such lesions have been found, the pre-existence of the lesion in the fundus not having been disproved; and yet the similarity between the effects obtained by Deutschmann in his experiments (cited above) on rabbits and those observed in the human eye is presumptive evidence that the actual lesion in the latter case is also a destructive coagulation of albumen in a minute area of the fovea centralis, together with congestive or inflammatory changes beneath and around this spot, although the condensation of the light in the case of Deutschmann's rabbits and the dilatation of their pupils constitute an important difference in the conditions.

In order to ascertain whether the invisible heat-rays were concerned in producing the changes in the fundus found in the rabbit under exposure to direct sunlight, Deutschmann caused the pencil of light to pass through a stratum of water two decimetres thick before reaching the eye. The same effect as before was obtained, but required rather longer for its production; but, of course, the mere exclusion of the obscure heat-rays does not exclude *heat* as the essential cause of the mischief, for it can readily be shown that in the mixed radiation from a luminous object the light is capable of being converted into heat; therefore, that the light-rays also raise the temperature. The use of dark glass in Deutschmann's cases did not suffice to prevent the damage to the retina.

The spectroscope declares that the solar, gas-flame, and the electric-light spectra have for their base a continuous strip or band of light—in the case of the gas-flame (the bright part) crossed by the sodium lines only; in that of the sun, by Fraunhofer dark lines; and of the electric (arc) light, by the bright line of carbon. The illuminating power of each of these sources of light is thus shown to be due to the incandescence of their several solid and gaseous constituents.

It is of practical importance to learn something about the relative effect of the different forms of artificial light on the human retina. All forms of artificial light contain, as compared with daylight, an excess of waves of long wave-length, *i. e.* they are of a *yellowish* hue. In the electric light the short-wave rays predominate, *i. e.* the violet rays. The ultra-violet region in the light of the electric arc is from six to eight times as long as the whole of the visible part of the spectrum.

Even the electric light looks yellow as compared with daylight, which latter, although generally called *white*, has been shown to be decidedly *bluish;* but, as far as mere *color* is concerned, the *electric light* approaches nearer to that of the *sun* than does the gas or lamp flame. But which has the more to do in producing evil effects on the eye after long and continuous work by artificial light—*color* or *heat?* Meyer gives the following proportionate constitution for three kinds of artificial light:

	Red.	Green.	Blue.	Violet.
Electric	2	1	0.8	1
Petroleum	3	0.6	0.2	0.1
Gas	4	0.4	0.2	0.1

Gas emits the greatest amount of heat; petroleum lies between gas and the electric light. The fact that there are, in the electric light, no gaseous products to radiate heat without light, taken together with the high temperature of the incandescent carbon, unite to give us the maximum of light with the minimum of heat. Those who have a great deal to do with the *arc electric light*, which is intensely brilliant, say that the injurious effect on the eye depends a great deal on the

nature of the light, *i. e.* a violet light, produced by an excess of current, or an orange light, given by a defect of current, is less injurious than the normal light—white, tinged with ashy blue—and that a fluctuating light is always more dangerous than a steady one.

Tyndall has shown that the value of the luminous radiation from the flame of oil, gas, and the electric light is as follows :

	Luminous.	Obscure.
Oil flame	3	97
Gas flame	4	96
Electric light	10	90

We have therefore, with the *electric light*, the *maximum of light* with the *minimum of heat*. We have seen that in the electric light the short-wave rays predominate, *i. e.* the *violet rays*, and that the *ultra-violet* region in the electric arc is from six to eight times as long as the whole of the visible part of the spectrum. We know that chemical action is more energetic in this part of the spectrum than in any other part, and that this action extends beyond the violet to the *ultra-violet rays*, and the properties of this part of the spectrum are very strikingly shown by the pronounced action exerted by the electric light in the growth of plant life.

Chardonnet (Vision des radiations ultra-violettes, Compt. Rend. hebd. des Séances de l'Acad., No. 8) has recently made some interesting investigations on the absorption of ultra-violet rays by the media of the eye, particularly by the crystalline lens, this absorption not being done without fatiguing the eye, especially when it concerns the long and brilliant spectrum of the *electric arc*. But he found, on photographing the spectrum of the incandescent electric light, that the spectrum hardly passed beyond the visible spectrum ; hence he inferred that this incandescent electric light saved the media before the retina the labor of absorbing and diffusing the ultra-violet spectrum. I do not believe that we should attach much practical importance to this explanation. It is easy to convince one's self that the inconstant and unsteady intense glare of the *arc electric light*, only faintly modified by an *opal* or *ground-glass globe*, is extremely distressing to the eyes.

So far all the cases of injury to the eye from the electric light recorded in medical literature have resulted from exposure of the eye in close proximity to the *arc electric light*, and this has, in every instance, been of a very intense brilliancy, generally that used for street illuminating purposes—two-thousand-candle power—which may be actually fifteen-hundred-candle power. In many of these cases a pre-existent abnormal condition of the eye was not excluded; and if we compare the groups of cases so far recorded, the evidence seems to me to point more directly to a reflex nervous influence —*i.e.* that we can best account for the condition by invocation of the sympathetic nervous system, rather than by assuming an actual mechanical or chemical injury. The severe pain and photophobia complained of would certainly be explained by the excessive stimulation of the whole retina, and, corresponding thereto, a general hyperæmia of the uveal tract; and these causes might naturally augment any pre-existing retinal or choroidal affection. At any rate, with regard to retinal changes it is not by any means established that simple dazzling by bright light can produce a progressive diffuse retinitis, such as has been claimed it has. However, the case of the late Professor of Physics at the University at Ghent, J. Plateau, who, in 1829, while trying to observe the effect of irritation of the retina, gazed steadily at the sun for twenty seconds, chronic irido-choroiditis having resulted (?), followed by total blindness in the course of fourteen years, is on record.

So far as I have been able to ascertain, no case of accident to the eye has been reported as having been caused by the *incandescent electric light.* Of the 1,100 persons whom I have examined and observed during the past year who work by day or by night for many hours by the *incandescent electric light* of *Edison's lamp*, there was not a single instance of injury to the eye; but, on the contrary, I was surprised to find that a considerable number of these persons, with a high degree of myopia and choroidal changes, were absolutely comfortable while working by this light, and they expressed themselves as having experienced a great improvement in the condition in their eyes since they had begun to work by the electric

light (Edison lamp of twelve- to sixteen-candle power), always shaded from the eyes, the light being thrown down upon the work from a short elevation. Many persons among type-setters and copyists have told me that formerly, when gas was in use in the establishment in which they worked, they went home from their work with their eyes red, watering, and aching, and this was especially the case among short-sighted persons, but that they could work longer by the Edison light (the arc light distressing them), and without discomfort. Of course, every form of artificial light is more or less dazzling when the source of light casts its image on the retina. We certainly can avoid this dazzling in the gas or petroleum flame by means of an appropriate shade ; but, in order to secure the requisite amount of illumination, we must either approach the light close to the head, and thereby expose the eyes to the undesirable radiant heat, or increase the illumination at a greater distance, and thereby make an increased demand upon the vital parts of the atmospheric air in the room, thus vitiating the latter, which is a very undesirable equivalent. The amount of heat radiated by the electric light is very unimportant ; and when, after sunlight, we add to its unrivalled qualities as an illuminator the steadiness and absence of combustion of the *incandescent lamp of Edison*—there being, therefore, no consumption or vitiation of the atmospheric air induced by it—together with the practical clinical fact that it is a greater comfort for even persons with existing eye affections to work by this light than by any other artificial illuminator, we must, from a therapeutic point of view, concede to the incandescent electric light advantages not possessed by any other artificial means of illuminating; and anyone who has given the subject thoughtful consideration will at once see the great blessing which would come from introducing this kind of light into our *night-schools*, *theatres*, *public halls*, and those innumerable *counting-rooms* in great cities where large numbers of human beings work by artificial light during the entire day or night, the demand upon the atmospheric air by the individuals alone being, in the absence of adequate means of ventilation, and in the majority of in-

stances with very little ventilation at all, in these overcrowded places, terrible enough without the additional mischievous agent in vitiating the atmospheric air present in the many *gas flames*. The advantage of using the incandescent light in our ophthalmoscopic dark-chamber must be evident to every ophthalmic surgeon.

My conclusions are as follows:

The *arc electric light* is not so objectionable on account of its intense brilliancy, which can be modified by means of an opal or ground-glass shade or globe.

The gazing at the *arc lamp* for many seconds is attended with great risk to the eyes. The *arc light*, in its present state, should be positively rejected as unsuitable and actually harmful to the human eye, particularly on account of its unsteadiness.

The *incandescent light of Edison*, because of its steadiness, adequate power, and composition, is safe, and occupies at present the first position as a means of artificial illumination. By its use the accommodation of the eye is less taxed than by other illuminators.

The light may advantageously be placed on the table in *front of* the person using it, but it should *never shine directly into the eye*, but always be *completely hidden* from the eyes by means of an opaque shade made of glass or tin, and the light be thrown down upon the work. For obvious reasons, it is further believed that the incandescent electric light is especially beneficial to myopes.

DISCUSSION.

DR. AGNEW.—I would ask for a moment to say that Columbia College, of which I am a trustee, has built a very large room in connection with its library for the night use of students. I had something to do with the introduction of the incandescent light into it. Each table is provided with an electric light, over which is placed a conical shade to protect

the eyes from the direct light. For two winters, we have kept the library room open until ten o'clock every night except Sunday night, and our students have been encouraged to come there. The library was also thrown open to the public, a simple introduction with a card being all that was necessary. Persons engaged in literary pursuits have come in considerable number to the library to study. A number of persons with sensitive eyes have come there to test the effect of the incandescent light, and have obtained permission to do continuous work there every evening. They found that they could work longer with less detriment to the eyes there than in any other place to which they had access. They have come from rooms were they have had gas and kerosene lamps, many of them having previously secured what they had supposed to be the best means of illumination. The introduction of the incandescent electric light there, has proven of great advantage. I agree with the writer in all that he has said bearing upon that particular matter. This matter is worthy of the consideration of those having to do with colleges or schools requiring work at night. Aside from the fact of its not vitiating the air, the steadiness of the light, and the fact that it is directed upon the work and shielded from the eye commends it. I think that air poisoning has a good deal to do with the progress of eye diseases.

Dr. Mittendorf.—I am much pleased with the paper of Dr. Andrews, for two reasons. First, it confirms the results of my experience. I have had among my patients many clerks under observation, who work all day by artificial illumination. Second, because the popular feeling has been that the electric light was injurious. My experience has been to the contrary. Those clerks were much more comfortable after the introduction of the electric light. This is principally because the light is so perfect that the work need not be brought so close to the eye and the efforts of accommodation are less. The iris is given less work also than where the flickering light of the gas is used. It is principally the popular prejudice to the electric light against which we have to contend.

THE USE OF HOT WATER IN SOME OF THE CONJUNCTIVAL AND CORNEAL INFLAMMATIONS.

By B. E. FRYER, M.D., U. S. Army,
KANSAS CITY, MO.

THE success which I have had in the treatment of some of the conjunctival and corneal inflammations by the use of very hot water applications, is the excuse for the following remarks.

I have for a few years abandoned iced lint pleggets and cold water in acute purulent conjunctivitis and I never adopted them in the less active conjunctival inflammations. I propose in this brief paper to make a few remarks of a practical character in reference to the kind of cases, both corneal and conjunctival, in which I make use of this remedy, sometimes alone, sometimes combined with other means; and also to give very briefly the clinical method of application.

It may be well to state at first, that the water I use is of as high temperature as can be borne by the patient, and that this after a few hours of the application will be from 140° up.

I was astonished in the earlier cases (it being new experience to me) at the tolerance and even indifference to the heat by the patient. Water in which I could not retain my hand a moment, apparently made no unpleasant impression on individuals who had used it at the same temperature for a few hours or for a day or two. The temperature of the water should not be lower than 140°, and as much higher as can be tolerated, of course short of blistering. My method generally of making the application is the old one of fomentation. The patient is placed so as to lean over a bowl, and with a folded napkin dips the cloth in the hot water, and without wringing it applies it to the closed eyelids. This is repeated every few seconds, and continued generally for half an hour at a time every two or three hours day and night. The hot water is replenished continually, as it cools. An easy and simple

mode of almost continuous application can be readily had, by letting the water flow from a tube connected with a reservoir suspended above the patient, the patient on the back; a piece of linen cloth being laid over the eyelids, the water drops on that. Rubber cloth can be easily arranged to protect the patient's clothing and bedding, and the water made to flow into a receptacle on the floor.

It is not of course to be supposed that the patient can at once begin with very hot water. The tolerance is different throughout in various individuals, but most persons can get to use the water hot enough in a very few hours, and many will not object when it is even near the boiling point. Those practitioners not familiar with this can scarcely appreciate the indifference of patients to the heat of the water, attained in a short time. In many cases I recommend the fomentations for half an hour at a time (by the watch) every one, two or three hours. In some, the time of applications is lessened and the interval increased. In all the cases I now direct a cloth wrung from the hot water applied and allowed to remain during the intervals of non use. In the most severe cases I make the continuous application, by letting the water trickle from a tube.

In some cases of acute purulent conjunctivitis I direct water as hot as can be safely applied, thrown into the conjunctival sac frequently. In gonorrhœal ophthalmia I invariably do so.

Now as to the kind of cases in which I have made use of the hot water applications.

In acute purulent conjunctivitis I find it cuts short the inflammation more quickly and safely than the iced cloths. I find, after trying it in several cases of severe gonorrhœal ophthalmia, that it more quickly lessens the swelling of the lids and the chemosis. Ulceration of the cornea is less likely to occur, and if it does begin is less likely to progress. Moreover the ulcers not only heal more quickly, but with a much lessened amount of cicatricial tissue and a less opaque one.

I do not claim that hot water alone will destroy the specific gonorrhœal, or any germ of the purulent conjunctivitis as

found in the pus from the conjunctival sac, but it will probably destroy its specific power as it flows from between the lids. I deem it better and safer to add the use occasionally of either instillations of sublimate solution or portions of iodoform finely pulverized, with this object.

Unfortunately the hot water, as might be supposed, is not so readily applicable in ophthalmia neonatorum, though I have used it with success there.

In catarrhal conjunctivitis I find it a good adjuvant, and also in phlyctenular ophthalmia.

In keratitis both acute and chronic I use the hot water with even more success.

In corneal abscess, it will more often, I find, produce absorption without ulceration than the older methods.

But I believe its most marked effect is seen in corneal ulcer. I have treated a number of cases of large ulceration and several with perforation, both combined with purulent discharge and also not, in which the eyes seemed lost beyond all doubt, and I believe that with any other treatment they would have been lost. I have seen healing begin and go on satisfactorily to complete cicatrization. Moreover, I have been astonished, and those of my friends who have tried this almost continuous use of very hot water have been astonished, at the comparatively small amount of resulting opaque tissue. Wecker has spoken of eserine as producing this effect, and I have thought him correct as to that, but my experience with hot water is that the resulting opaque corneal tissue is even still more marvellously lessened by the hot water treatment.

The pain accompanying many corneal ulcers is very materially diminished, and is especially so if there be iritic complication. And though of course cocaine will do this, it is as yet uncertain in asthenic ulcers how long we may safely continue the application of it.

I find that photophobia is also diminished by the hot water in cases of corneal lesion.

I have for several years used very warm water instead of cold in washing the everted lids after their treatment by the

ordinary astringent applications. I find this more agreeable to the patient, and I believe it assists or reinforces the effect of the other applications. It is certainly more soothing than the cold water.

The point which I desire to urge in this paper is that the hot water applications do, in the conditions I have mentioned, better work than cold applications and better than tepid ones.

The water must be hot, and it must be applied continuously or nearly so to get the full advantage from it.

DISCUSSION.

Dr. Prout.—I have always had a prejudice in favor of warm water. A few years ago, Dr. Conner, of Detroit, published an excellent paper on this subject, and since then I have used it with more confidence in its value and with good results.

Dr. Norris.—I have had good results from hot water in gonorrhœal ophthalmia. Of course I did not save all the eyes. I have, however, not used water as hot as that recommended by Dr. Fryer, employing it at a temperature of 120°–125°, the hot water being applied day and night. The application is comfortable to the patients, and some apparently desperate cases have recovered with good corneæ.

Dr. Theobald.—I have used hot water, not in purulent troubles, but in interstitial specific keratitis, and I am sure that it has been of benefit. I think that it promotes absorption of opacities of the cornea. Constitutional treatment and the use of atropia accompanied the applications of hot water.

A NEW TEST TYPE.

By WILLIAM S. DENNETT, M.D.,

NEW YORK.

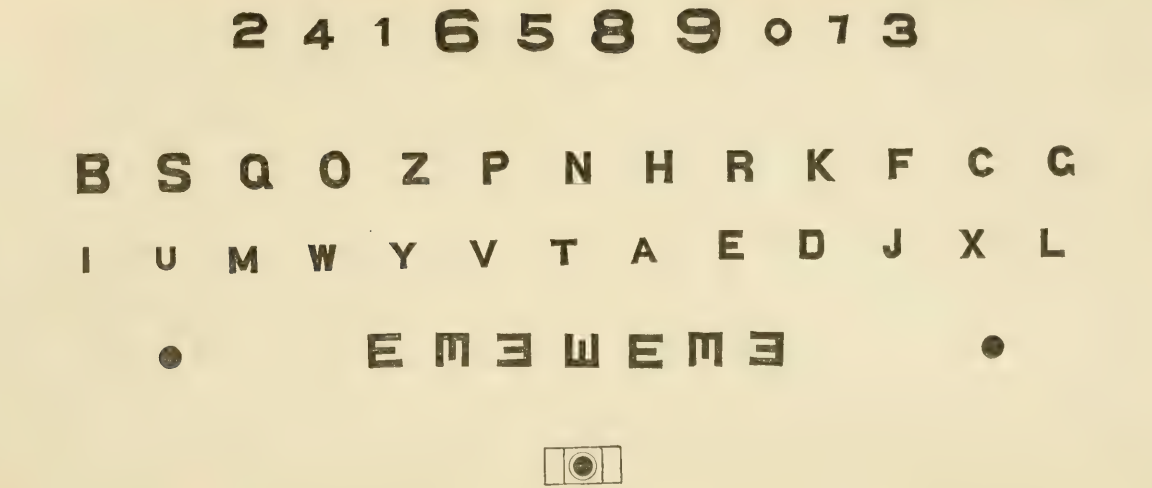
Since the publication of the modified form of Monoyer's card of Test Type, which it was my privilege to exhibit at the last meeting, I have been called upon to supply one or two of our higher educational institutions with that card, to be used for hygienic or anthropometric purposes. This in part led to

the designing of another card for use in schools and colleges, which I now have the pleasure of showing you.

It is only necessary to call attention in passing to the fact that although the schools of the civilized world have been for a quarter of a century under the observation of oculists, and though the amount of work done in patient investigation and the careful tabulation and arrangement of results is such as would greatly surprise anyone not already familiar with the subject, the schools themselves have thus far taken little or no practical interest in the matter. It is a well recognized fact that from fifty to seventy-five per cent. of those who go through the ordinary routine of school and college life suffer more or less, and many of them suffer severely, from the morbid processes incident to that age and habit, and the habitual neglect of these troubles is well known to us all.

Oculists have many times proposed that yearly or half yearly examinations of the eyes of school children should be conducted by teachers or by experts employed for that purpose; and incalculable good might be done in this way. Dr. Hasket Derby, of Boston, took the trouble to write full directions for such examinations, and they were published on the back of Monoyer's card, and have been kept in stock up to the present time by one of the well known educational book publishers. I am inclined to think they have never been used except by one or two colleges whose students are under the care of professors of physical culture.

There is no doubt that such examinations are much needed, but the friction necessary to establish a new routine in a community where there is no very general and popular demand for it, and where there would be at first no very wide spread appreciation of the advantages thus gained, has been so great that suggestions in this line have never been carried out. Experience does not seem to encourage us in the belief that the scholars of the present day will have the benefit of any such examinations. It is hoped that the card here shown will in many cases accomplish the same result, without involving the institutions who see fit to adopt it as a standard in any material outlay of time, mental energy or money.



The above card is reduced one half to fit the pages of the Transactions. On the original card is printed these words: "Each of the above characters should be distinguished by the healthy eye at five metres (5. m.) or sixteen feet (16 ft. 4 in.). The upper line is one foot in length, the lower one is one quarter of a metre. The three bull eyes give the apparent size of the targets in use in the United States Army and National Rifle Association. The right is for three hundred yards, the left for six hundred, and the lower for one thousand." [Copyrighted.]

The card contains only one set of numbers, letters and other characters, each of which should be seen at the conventional distance of five metres, and it is designed to be fastened conspicuously on the wall of every class-room, so that it shall become a familiar object to every scholar, that no one may grow up without some definite idea of just what a healthy eye ought to see. Such knowledge almost never exists among either the young or the old. The presence of this card in the schoolroom will call attention to the fact that such a standard exists, and will put in the hands of every scholar and teacher the means of recognizing in himself and for himself any marked deterioration that may have occurred in his own visual apparatus. It has been thought best to print on the face of the card a clear statement of the distance at which a healthy eye should be expected to distinguish the characters, and also a line, one foot in length, from which a measure of the distance (sixteen feet) may at any time be obtained.

METHOD OF OVERCOMING DIPLOPIA WHEN PRISMS ARE NOT FULLY EFFECTIVE.

BY WILLIAM S. LITTLE, M.D.,
PHILADELPHIA, PA.

WHEN resort is had to prisms to neutralize a diplopia in the visual field they are not always found fully efficacious; especially is this so, when the double images are below the horizontal plane; unless the adjustment of the spectacle frame is very accurate and the patient accommodates the movements of the head to the necessity of the condition, he is apt to see under his glasses, and become liable to accidents.

As the diplopia improves under medical or surgical treatment, change of prisms is also essential and weaker prisms are frequently required; till the maximum of overcoming the defect is obtained, one prism cannot be depended upon. To avoid the use of prisms, both on account of the liability to

accident when the diplopia is in the lower field especially, and the necessity of changing the prisms, I have found the following method serviceable in a case of modified paresis of the superior oblique of long standing and in which further improvement has not been obtained.

The double images are neutralized by a prism of 6°, base down and out, centre of apex at 50°. The patient has a compound myopic astigmatism in each eye. The right eye is affected with paresis of the superior oblique. Vision is effective as long as the optical centre of the glasses is looked through. Having had one or two accidents by looking under her glasses, it has been found necessary to devise something better, as surgical measures have not been deemed advisable or accepted. The minus sphero-cylinder for the right eye has been ground opaque to the sixteenth of an inch above the horizontal plane; to the lower margin of the spectacle frame there has been attached the wire netting used in protection glasses, and this has been painted so as to fill up the openings in the wire and been carefully adjusted to the lower region of the orbit or face under the eye. By this means vision with the right eye is cut off entirely in the lower field, where the diplopia for both eyes exists, while in the upper field the right eye has vision and is associated with the left eye in the visual act. The wire can be painted any color, or any material can take its place, but it is light and easily adjusted. The patient is very much pleased with the method, the spectacles being lighter than the one with the prism in. The same plan can be used in a diplopia in any part of the visual field, as I have tried in a case of paralysis of the external rectus.

This method is better than cutting off all visual effort in an eye by wearing a shade, a ground glass spectacle, or any device neutralizing the whole visual field in an eye.

Where presbyopia exists in these cases, a method I have found advantageous to the patient, to prevent diplopia for the near, is to correct the presbyopia for one eye only, leaving the other eye to control distant vision, having its defect corrected for the far if any exists. These glasses can be reversed

so as to put the presbyopic correction on the affected eye, when distant vision with the other eye is desired; this is safe in the sitting posture, but not altogether secure for walking. This method has very likely been adopted by others in treating such cases, but if not, will be found of advantage in the earlier stages of such affections of the eye, till treatment medically or surgically has given relief partially or completely.

(Borsch & Rommell constructed the spectacle for the cases.)

A NEW SERIES OF BERLIN WOOLS FOR THE SCIENTIFIC DETECTION OF SUBNORMAL COLOR-PERCEPTION (COLOR-BLINDNESS).

By CHARLES A. OLIVER, M.D.,
PHILADELPHIA, PA.

The value of the study of the human color-sense as a means of detection of faulty development of the organs of vision, or of subsequent pathological change, cannot be overestimated when we think of the important rôle of action that color-vision plays in our daily routine. Not only is this true for the individual's benefit, as a source of exact knowledge for the determination of some congenital malformation connected with the organ, or of giving a correct answer to the diagnosis, prognosis, and treatment of an acquired and vaguely symptomatic local or general disease, but it is equally applicable as a check to the danger imposed upon general communities who might be dependent for their lives and property upon the functions of imperfect visual organs placed in positions of danger and trust.

Casting aside all of the various theories of color-perception which have been evolved, such as—the Young-Helmholtz

three-fibre theory, originating with Thomas Young in 1792 (although claimed to be an outgrowth of Wünsch's hypothesis), and modified by Helmholtz, Maxwell, Rählmann, and others; the three-paired primary sensation theory of Hering, said to have found birth in Arthur Schopenhauer's theory of color-vision; Delbœuf's belief of retinal vibration; Salom's fancy of localized vibratory action in the macular region; the chemical chromatic and achromatic excitation of Wundt; Krenchel's movable color molecules situated in the cerebral color-centres; Preyer's paired Anachromatic and Katachromatic cones, etc. etc.; and discarding any allusion to the numerous hypothetical changes which are said to be productive of subnormal color-perception, we are brought to the question, how can lowered color-sense be best and most readily recognized.

Practically there have been three methods.

First, Direct Comparison of Pigment Colors. This has been done by many contrivances; principal amongst them is Holmgren's method of loose wool selection, analogous to Seebeck's paper-test, and Wilson's worsteds. These plans have been modified by the assortments of fixed colors arranged upon cards, sticks, spools, discs, and other articles; the best known being the color-tables of Daae, von Reuss, and Roberts, the yarn covered spools of Schenkl, Donder's rolls of pseudo-isochromatic wools, Thomson's stick, and the embroidery patterns of Cohn. The most serious objection to these modifications is, that in all fixed tests or plans where colors are made to relate to each other in any definite order, the method, if pursued amongst a great number of similarly placed individuals, is liable to become known, and rendered practically worthless. Again, another objection may be raised, that pseudo-isochromatic arrangements of wools upon cards, discs, sticks, spools, etc., are merely arbitrary with the surgeon, and do not by any means express the many percentages of lowered color-vision presented by the different candidates for examination, thus allowing numbers of persons affected with subnormal color perception to escape by reason of the confusion wools not being equal to the exact amount of resident color-error; and even a third difficulty may be cited, when it is

considered that the very process of fixation greatly limits the numbers of wools from which a choice may be taken.

Another plan by the same method has been by means of colored powders. This has been pursued by Mauthner and Cohn, who make use of four-sided homœopathic vials filled either with one color, a color and its shade, or two unmixed confusion or normal colors. They most probably suggested this procedure because Mauthner claims to have detected "color-blindness" by this plan in a patient who distinguished the color of yarns by the sense of touch. There can be no doubt that this assertion is in the main true, for Wartmann, as early as 1849, after noting three references, mentions that a man with well-marked "color-blindness," "corrected by the help of touch a part of the erroneous judgments which he formed regarding colors;" whilst in 1855 Wilson noticed that the first example of subnormal color-perception he ever encountered, possessed the same power to some extent. The latter author justly attributed this supplemental use of touch to delicacy of the tactile sense in discriminating between the harshness and smoothness of variously colored dyes, and says that "a wool dyed with a mineral green might thus be distinguished by the touch from one dyed with a vegetable, although the color-blind eye could detect no difference between their tints." In order to test how far this knowledge might interfere with selection by wools, the present writer, through the kindness of Dr. George C. Harlan, visited the "Pennsylvania Institution for the Instruction of the Blind," and there met Mr. Battles, the Assistant Superintendent, and a Miss Townsend, one of the Instructors. They kindly gave him a vast amount of valuable information and the results of special research in this direction. In brief, their testimony showed that a few of the most intelligent and dexterous amongst the blind possessed the power of telling the dark-colored wools from the light ones, by a feeling of harshness of the dark skeins, although to obtain anything like a majority of proper results necessitated quite a long and frequent association amongst such objects. Curiously, some wools were detected by the sense of smell; the white ones having, as

they termed it, "a woolly odor."[1] One experiment with an intelligent blind woman, a native of China, who for many years had been a teacher in various institutions for the blind, showed that both she and the writer agreed in several instances as to the tint and shade of color in an ordinary set of Holmgren's wools, by the sense of touch alone, she strenuously denying any further attainment of powers than those which were elicited by touch and smell. This agreement of result is to be accounted for by the fact that the writer has been giving much of his time and attention to this question, which necessarily enabled him, by education of finer tactile differentiation in this direction, to cope with the person mentioned in the above experiment.[2]

In view of the above statements that it requires long training of the tactile and olfactory senses to arrive at any but an imperfect idea of the color of the dyed wools by touch and smell, associated with the fact that as a rule an untrained candidate is brought as it were into a new color sphere, where he must almost momentarily give decision, nullifies any practical objection to the use of the worsteds.

These are three difficulties that arise from the employment of colored powders enclosed in glass. The first, which is the least important, is somewhat of the same nature as that which attends the selection of the wools. Chemists, dyers, and persons employed about color-laboratories, are enabled by knowledge of the appearance of coarseness and character of an enclosed powder, to ofttimes place it where it really belongs, even though it has not the proper color characteristic. The second is the same objection that was urged against having two colors fixed together for comparison, because many of

[1] Wilson quotes a Mr. Shirra as having heard of a woman blind from infancy, who was enabled by her sense of feeling to distinguish many colors, white being known to her by its sulphurous odor.

[2] Of course in this discussion, other characteristics, such as association, previous knowledge, and judgment, become important factors. *Apropos* of this, a few weeks ago, Dr. Harlan related to me quite an amusing anecdote of a blind man who pretended to designate color by touch. Experiment showed, to the wonder of all present, that he readily gave the colors of the coats of three persons merely by feeling the garments with his finger-tips. To the first he said, "You have a black coat!" to the second, "Yours is a blue one!" and to the third, "That is a gray!" It was afterwards discovered that he was made aware of the fact by correctly judging the colors, when he felt that the first was a frock coat, the second, one with brass buttons, and that the third was that of a Quaker.

the arbitrarily chosen colors do not express the exact grade of lowered color-sense of the examinate; thus in many instances permitting the colors to be readily differentiated. The third, which is of such a serious nature as to necessitate an abandonment of the plan, consists in the numerous changes of appearance that the enclosed color undergoes by the reflection of diffuse light from the glass surfaces of the containing vial. No matter in what direction the color may be looked at, there is more or less of a glare from the glass, which practically alters the intensity of the contained color, and gives a new quotient to its value—one often different from that which was intended.

The third plan of selection by pigment colors combines many devices, foremost amongst the numerous collections being Seebeck's test-papers, Maxwell's and Woinow's revolving discs, the color-plates of Stilling, Hierlinger's and Magnus' tables, the Optotypi of Snellen, Kolbe's truncated cone, and Lip's Color triangle. The majority of these plans are open to the same objections of gloss, and errors arising from fixation and want of exact equivalence, that have been previously given.

Second. Direct Comparison of Spectral Color.—In this method the two principal and most ingenious plans are combined in the Double Spectroscope of Hirschberg and the Polariscope of Rose. That the results by this method are valuable and interesting to the scientific student, cannot be denied, yet upon account of the expense of the apparatus, its complicated mechanism, its liability to get out of order, the necessary intelligence of the candidate in handling the instruments to produce proper results, and the differences between spectral and pigment colors (the latter being the ones with which the "color-blind" deals the more), it unfortunately cannot be brought into every-day employment as an ordinary test for the quick detection of lowered color-sense, although it most certainly can be made to serve an extremely useful purpose in cases requiring more than ordinary observation, as in malingerers and persons under judicial action.

Third. Subjective After-color (Complementary Color).—This method is merely mentioned as an ophthalmological

curiosity, because, for several reasons, it is practically useless. Much interesting study has been expended upon it, and many contrivances have been made in hopes of making it useful. Instruments and devices to show, both "simultaneous-contrast" and "successive-contrast" have been devised, prominent amongst them being the Heidelberg Color-books, the Color-books of Pflüger, Ragona Scina's Mirror-contrast adapted from Ossau's experiments, and Stilling's colored shadows, arranged by Holmgren into a single apparatus termed "Chromotoskiameter," and again modified by Cohn into his so-called "Chromaskiopticon." The most palpable objections that may be brought against this method, and which throw it out of competition with the other plans, are, in the first place, that we are dealing with subjective colors which are so vague and dependent upon so many idiosyncrasies, that no reliance can be placed upon the visible significance of their true character; again, that it must be remembered that all the experiments require the utmost care of adjustment, and that the least impropriety on the part of either the examiner or examinate utterly destroys the test: further, the old drawback of changeable luminosity is met, the moment artificial light is attempted;[1] and various thicknesses of tracing-paper or plates of colored glass of different intensities are employed; lastly, and this is the greatest error, if a "color-blind" is not wisely asked to *match* the contrast-color he sees with some known series of colors, such as wools, papers, etc., he will most probably escape detection, because it has long been known that the correct naming of color is a far different problem from the correct seeing of color.[2] Consequently, if this method compels a "color-blind" to compare color, as should always be done, the examiner might as well discard this series of difficult tests, and resort to the simple, more satisfactory and readily comprehended plans.

Although these brief references do not by any means exhaust the *armamentarium*, yet the above contra-indications apply as equally to many of the absentees.

[1] In fact, an absolute change of color-vibration.
[2] Pflüger well understood this when he made the patients match the colors.

Of all the plans, that of Holmgren is by far the best, where actual comparison of color is intended to be made amongst large numbers, this being accomplished by the use of a series of cheap and easily handled Berlin wools. Here there is no complicated apparatus, no doubts arising from imperfect working-machinery, and nothing dependent upon faulty naming. In support of this, the writer cannot do better than reëcho the statement made by Jeffries, that—"The whole recent widespread control of the chromatic defect on land and sea in Europe has come undoubtedly from Professor Holmgren having introduced a test for color-blindness, so simple, so perfect, and so applicable to the desired purpose as to render its use imperative, and its success a matter of necessity." The method itself is too well understood to need explanation, and needs no further recommendation or praise, but the writer in a desire to place the plan upon a more substantial basis, whereby the getting and proper registration of the color-sense may be quickly obtained with as few loop-holes of error as possible; that mistakes which might arise from imperfect wool selection as to color, character of dye, and choice of material may be avoided; and that some definite grading as to the exact amount and character of lowered color-sense may be made common property throughout the ophthalmic world by a plan of naming, which although comprehensible to any instructed layman, is rendered unintelligible to the patient: these reasons, associated with the fact that this series has been so arranged that all of the employed colors have been made of relative equal intensities in order that really nothing but the question of color-matching is presented to the candidate, and which thereby throws out any chance of easy selection through shading (which is the stronghold of the "color-blind"),—have induced him to bring before this Society a new series of loose wools based upon those of Holmgren, for the scientific detection of subnormal color-perception.

In this set there are three series of color.

First. Five principal test-skeins. These are pure colors. Latin names have been employed to represent them. Pure green has been styled "Viridis;" pure red has been termed

"Ruber;" pure blue, "Cœruleum;" pure yellow, "Flavus;" and rose, "Rosa." These colors have all been made of equal intensities, by using the pure green as a sample, and making it correspond to the sample skein of Holmgren. They have not been designated in any manner, except by making them of large size.

Second. A series of twenty small pure match-skeins. Each skein is either a pure tint or a pure shade of one of the large skeins. Each skein has a small black metallic bangle containing intaglio lettering, fastened to it. This inscription indicates that the attached skein is either a tint or a shade of one of the principal tests. The tints are numbered, first as T1, which shows that the wool is a first remove lighter from the test-skein to which it belongs; and second, as T2, which shows that it is a second remove. The shades are marked either as U1, which shows that the skein is a first remove darker than the test, or as U2, which shows that it is a second remove darker.[1] In addition, every such skein has the initial of the name of the principal test-skein to which it belongs, stamped upon its bangle. This series will thus include two pure tints and two pure shades of every principal skein, each having its proper designation.

Third. A series of seventy-two small confusion match-skeins. Each skein contains a mixture of certain definite percentages of light and shade of two of the principal skeins. Each has a bangle which shows that the skein is a mixture of two of the principal test-skeins, and that it is a certain remove of tint or shade. This has been done by having each bangle contain the initials of the two component principal colors (the presiding color being designated first), followed by the initial letter for the tint or shade, and its number.

The wools are to be wrapped in a piece of black muslin, and will be enclosed in a black box, which will also contain an explanatory sheet with the colors arranged in their proper order, together with a book of instructions and a spectacle frame with a movable stop.

[1] T (Tinctura) really signifies a tint or color, but is here used to designate *a tint of color*. U. (Umbra), Latin name for shade.

In addition to all of the good qualities possessed by the Holmgren wools, the following additional advantages can be claimed in this series.

1. *Five principal tests.* There have been two pigment colors added; these are pure blue and pure yellow.[1] This has been done intentionally, in spite of the many theories that have been brought to bear for and against the admission of these pigments into the color-sense testing. For the present, theory has been discarded in favor of practice, because by long experience, both of these pigments have served as useful tests in the detection of the barely perceptible color-changes which occur in the incipient stages of optic-nerve disease. Pure green, pure red, and rose have been kept, for reasons already explained by Holmgren.

2. *The wools are loose and separate.* As has been previously shown, this is the only proper way, because not only has the candidate the entire mass of color from which to select, but there is absolutely nothing in his choice, by which judgment as to plan can be brought into play. In support of this assertion, Cohn in the description of one of his tests, states a fact, of which all practical ophthalmologists are aware, that every "green-blind" does not make the same mistakes, or does not go through any routine order of confusion colors. In addition, it may be stated that this rule applies equally as well to all forms of lowered color-sense.

3. *The colors are all of equal relative intensity.* This has been done by having each principal test-skein of the same intensity, as well as every related tint and shade, thus making the selection a question of color-choice alone. Here any interference to accuracy is avoided by keeping free from the great power of skilful shading possessed by the "color-blind." This avoidance has not been accomplished by any other plan that the writer is aware of. Herein rests one of the greatest claims of this method for adoption.

4. *Each test-skein has its value expressed.* Every skein be-

[1] The Rose (purple) test of this series has more red in it than is usually found in this sample amongst Holmgren's wools. This has been done so as to get all of the principal test-skeins of the same degree of saturation and intensity.

comes a unit of worth and is related in some definite place with every other skein in the test. This has been consummated by the selection of tints and shades of relative intensities of chosen pure colors, and by a system of bangles which have been rendered incomprehensible to all but the initiated.

5. *It can be employed by any educated layman.* By means of the bangles, the registry of the candidate's choice of the wools is an easy matter for any one who has been made acquainted with the *technique* of the method. A brief and concise report of the selection can be copied upon a printed blank form, which can be sent to any authoritative person, by whom it can be studied, and the color-sense of the examinate properly and fully determined. This embraces the ingenious plan of Thomson.

6. *Accurate notings of passing color-changes can be preserved and permanently kept for future comparison.* This has been accomplished by the employment of the system of wool naming, and is of importance as furnishing means by which more accurate study of disease can be made, better notions of prognosis given, and more useful plans of therapeutics applied.

7. *Written and verbal expression of the character and amount of subnormal color-perception can be given.* This will be valuable in affording the reader of any article or hearer of any paper upon this subject, more exact data in reference to the nature and degree of the various color-changes noted. The vague terms now employed in expressing lowered color-vision can, by this means, be discontinued, and determinations like those used for the acuity of vision, range and amount of accommodative action, intra-ocular tension, etc., readily substituted, thus rendering the subject and its conditions at once clear and definable throughout ophthalmic writings.

8. *All the wools are of the same grade of manufacture.* This is important, and destroys in measure any argument that can be urged against the employment of this material in color-testing, because by having them all of a similar nature, and alike in reference to the contained percentages of Lanolin (so-called Agnine), the chances for color-selection by the supplemental use of touch are greatly lessened.

9. *All the colors are from vegetable dyes.*[1] By attention to this fact, the question of any possible error that might arise either from harshness or smoothness of color-surface allowing detection by the sense of touch, is absolutely avoided. Besides, such colors are more lasting to light-exposure than aniline mixtures, and are not so subject to odor.

10. *The use of a black surface or ground for testing.* By throwing the wools upon a black surface there is nothing but a display of color. We thus greatly avoid contrast and lessen any chance for the formation of subjective after-colors which are so apt to form in diseased visual organs.

11. *Any order of testing may be pursued.* This is done by naming and not numbering the various tests. The green test (No. I. of Holmgren) is known as the V. (viridis) test; rose (No. II. of Holmgren), as the Ro. (rosa) test; red (No. III. of Holmgren), as the R. (ruber) test; blue, as the C. (cœruleum) test; and yellow, as the F. (flavus) test; these latter tests—the blue and the yellow—are also known as "confirmation-tests." By this nomenclature, any color may be taken first, and any order pursued, without hurting the results of the examination in the least.

12. *Quantitative determination as well as qualitative determination obtained at one sitting.* This for many reasons is invaluable, and has not been accomplished by any other method.

The general plan of procedure is practically the same as that amongst the ordinary wools, and it would be of no determinate value, except as a matter of precision, to enter into a detailed account of the method of examination and diagnosis in this series: this has been reserved for a book of instructions which will be published with the set.

James W. Queen & Co., of Philadelphia, have gone to considerable expense and great difficulty in having all of the wools imported from a large European house. Sets can be procured in a short time. The writer will be pleased to assist any one in obtaining the proper selection of wools, and to give all the necessary information in reference to their manufacture.

[1] Some of the dyes in the present invoice of wools are not vegetable in character, although differentiation by the sense of touch is impossible on account of the equal intensities. For this reason they have been employed, yet in order that the collection may be absolutely void of aniline material, particular attention will be paid to this question by the manufacturers in all future selections.

HOLMGREN'S AND THOMSON'S WORSTEDS IN A NEW FORM.

BY WILLIAM S. DENNETT, M.D.,
NEW YORK.

SOME time ago I conceived the idea that rather an elegant set of test worsteds might be obtained by substituting for each skein in Holmgren's set, one of the worsted spheres about an inch in diameter that are used in the manufacture of trimming. Meyrowitz Brothers, the opticians, have had a few sets made in this way, and I have one here.

As far as color and material are concerned they differ in no way from those previously used. But there are one or two advantages to be derived from using the worsteds in this form.

Each globe is one inch in diameter, and there are one hundred and forty-seven of them, contained in three trays, each one of which is lined with one of the three test colors. These trays exactly fill a box seven inches square and three deep. The colors are the same as the set furnished under Dr. Jeffries' supervision.

The examination can be made by placing all the worsteds on the table and asking the patient to throw into the empty trays the color indicated by the lining of each. On account of their spherical shape, each worsted presents the same surface to the light and to the eye, securing equal illumination. No color is covered or hidden by its neighbor, but all are in plain sight at once. To each sphere is attached a paper tag, which is numbered. The first numbers correspond in color to those used in Dr. Thomson's test, and they alone or the whole set may be used as directed by him when the examinations are to be conducted by one who wishes to report the results to an expert.

The numbers are occasionally convenient in making records.

TWO EPIDEMICS OF MOLLUSCUM CONTAGIOSUM.

By W. F. MITTENDORF, M.D.,
NEW YORK.

The contagiousness of the affection known as molluscum contagiosum has been a matter of dispute up to the present day, and the contagious principle itself is not known; in fact, on account of the failure of inoculations with the contents of the tumors, the contagiousness of the affection has been doubted by many.* I regret, therefore, that on account of sickness the investigations that I commenced, and hoped to lay before you to-day, are far from being satisfactory. But I wish to call your attention to the fact that two epidemics of the affection have come to my notice, which leave very little doubt to my mind in regard to the contagiousness of the disease. As these two epidemics occurred in homes for children, it may be pertinent to ask whether the affection should be classed among the diseases which, according to a recent law of the State of New York, require the isolation of the patients in public institutions, or whether they should be relieved of the trouble before they are admitted to such homes or asylums.

One of the epidemics, if I may call it such, occurred at the St. Stephen's Home, at Newdorp, Staten Island, which is famous for its splendid location, and where the children have the best of care. In the spring of 1885, a little girl was admitted to the Institution, with one or two small "warts" on the lids, which were noticed by the Sister in charge at the time. She paid little attention to it at first, but within a few weeks several of the other girls had the same growths appear on the eyelids, and in some instances they began to spread to the lips and

* Dr. Robinson, for instance, maintains that it is not a retention cyst, that it is a peculiar degeneration of cells, taking its origin in the rete of the skin, and that it is not contagious.

noses of the children. At the time of my visit to the institution, which was about three months after the admission of the first case, twenty-seven children, nearly all of them girls, were more or less disfigured by mollusca. Not one of this number had the eyelids free, and in most of them they were confined to this location, but in a limited number the growths had spread all over the face, and especially one of them, an otherwise pretty girl of about ten years, had between forty and fifty of them scattered all over the face. The rest of the body was not affected in any of the cases.

The other institution visited by this disease was the Nursery and Child's Hospital at West Brighton, Staten Island. The first case was observed about two years ago, and only a short time ago as many as forty-one children were affected. This number does not include one of the nurses and her child, because these lived outside the Nursery. At first, little attention was paid to the disease, and some of the children afflicted with it were given out to a farmer, who boarded them. In a short time the affection had spread to several of the children boarding at this farmer's place, to the child of the farmer, and likewise to his wife, disfiguring her terribly. In quite a number of cases the tumors, varying in size from a mustard seed to that of a pea, had spread to other parts of the face, but they were usually confined to or more marked at the lids; some were located at the free edge of the lid and among the eye-lashes. About three cases of spontaneous cure were observed, but as soon as my attention had been called to the disease, energetic treatment did away with it very quickly.

In regard to the treatment, I found that thorough abscission with curved scissors and touching the base with a stick of nitrate of silver was most satisfactory. The use of acids is painful and tedious, and the abscission of the more prominent growths is connected with very little pain. In order to remove the smaller and deeper seated ones I had to give an anæsthetic. Cocaine did not produce much anæsthesia, or perhaps the children were nervous, and pretended to be hurt more than they actually were. Simply pressing out the matter is much more painful than the use of scissors, and unless the

base of the growth is touched with caustic or cautery it will at times be followed by new growths of the same character.

Among the adherents of the theory of its contagiousness is Virchow, who observed the transmission of the disease from one child to another, and Tilbury Fox, who saw it spread through an entire family; but the fact that the disease may assume the dimensions of an epidemic has not often been noticed, or at least not recorded.

MELANO-SARCOMA OF THE CONJUNCTIVA OF THE EYEBALL AND OF THE CORNEA.

By W. F. MITTENDORF, M.D.,
NEW YORK.

The occurrence of sarcomatous tumors of the choroid are by no means rare, but when Dr. Noyes published his cases of these growths affecting and developing on the eyeball, there were only one hundred and twenty-seven of them recorded. Since this time several cases have been added to this list by Birnbacher, Hirschberg, Mason, Ormsby and others. Melanotic tumors affecting the anterior half of the eye are the rarest of all. The growths which I had occasion to remove were of the sarcomatous kind.

August 22, 1884.—Mrs. E. Merriman, aged forty-six, a native of the State of New York, was sent to me by her family physician. In April of the same year she noticed a blackish-blue tumor on the lower half of the conjunctiva, which her doctor removed. Shorly after this there were one small tumor on the lower half and two somewhat larger ones on the upper half of the conjunctiva of the eyeball, extending from the upper cul-de-sac to within 3‴ of the corneal margin. The tumors were of the size and shape of a cucumber seed and of such a peculiar color that I suspected them to be angiomata. They were very vascular, but, as the microscopic examinat on

proved, they were not entirely made up of blood-vessels, and many of the cells contained in them contained free pigment. One or two small black spots on the conjunctiva showed a peculiar black appearance; they looked as if a drop of ink had been dropped on the eyeball and was trying to penetrate the tissues. It appeared as if the pigment was spreading from the centre to the periphery as fast as it formed. Cells taken from this part were more or less filled with a black finely granular pigment. The conjunctiva surrounding the parts was slightly congested and the eye otherwise perfectly healthy. The vision of the affected eye was almost perfect, and the refraction slightly hypermetropic. The left eye, which has not become affected up to the present time, is highly astigmatic, and its vision not near so good as that of the affected eye. The patient herself is a strong healthy woman, looking younger than she is. There is not the slightest sign of a cachexia. She does not remember that she ever received an injury to her eye, nor has she ever suffered from sore eyes or any other serious illness, and the family history is good as far as known. The pre-aural glands as well as those of the neck were perfectly healthy.

The tumors were removed at the New York Eye and Ear Infirmary under ether, and the conjunctiva brought together by means of a few sutures. The healing process was rapid and perfect, and in a few days the woman returned to her home in the country.

About four months later she returned with two growths of a similar appearance to the first ones, starting from the lower portion of the outer canthus of the same eye. They were smaller than those removed, flat and not larger than a split pea. There was also a small flat growth on the lower margin of the cornea, but not connected with the tumors at the outer corner of the eye. The growth of the cornea was about 5 mm. long and not more than 2 mm. wide; the portion near the conjunctiva was pigmented, but the upper corneal portion of it had an opaque appearance, as if the corneal epithelial layer had been lifted. This proved to be the case, for after the removal of the growth the underlying corneal tissue ap-

peared not affected, her vision had not suffered and the cornea is at the present time perfectly clear, showing hardly any cloudiness at the seat of the former growth. After removing all the tumors as carefully as possible, the patient returned home, and for nearly a year I heard nothing from her.

In the spring of this year she returned with her eye almost closed. On examination this was found to be due to a flat tumor, of the size of a small cherry, that had developed from the scar of one of the former growths, and pushed in between the conjunctiva and tarso-orbital fascia. The orbit was not invaded, and the conjunctiva appeared perfectly healthy, except that at the inner canthus it had a swollen and red appearance. This portion as well as the tumor of the lid was carefully removed. It was found at this visit that the pre-aural gland and several glands of the neck were slightly enlarged; however, the general health of the patient remained good all the time, in fact she looked better than she ever did before, and had gained in weight since her last visit.

About four or five weeks later she returned on account of the rapid increase of the size of the upper lid. It was found that a new growth had started near the location of the former, and was so large that the lid could not be turned. I separated, therefore, the upper lid from the orbital margin, removed the tumor, and sewed the lid back to its place. The wound healed rapidly and looked very well when she left, but the ptosis was still marked. The glandular enlargement was more marked and at times a little painful. The cornea, however, was perfect, and the conjunctiva almost so, with the exception of two small black spots of the size of the head of a pin. They were of course removed. Sections of the latter, showing the pigmented cells, I expected to be able to show to you to-day, but they were taken out west by mistake, by the pathologist of the Infirmary, who reports to me as follows:

DETROIT, JULY 8, 1886.

DEAR DOCTOR.—The growths which you removed from the conjunctiva of Mrs. Merriman were sarcomata, composed mainly of medium-sized roundish cells in a but slightly defined stroma. The nodulous appearance of the nodules was chiefly due to

hæmorrhages into the parenchyma, the red blood cells retaining their form and betraying beginning disorganization only by their color. In some parts, however, particularly in the smaller nodules, the tumor cells contained pigment granules in considerable quantities, presenting, in short, the ordinary appearances of melano-sarcomata. Sincerely, H. Gifford.

It would be interesting to know whether the hæmorrhages and the following degenerative changes of the blood-vessels, which were noticed at the periphery of the very small growths, are part of the process or only accidental, and due to the endothelial degeneration in the interior of the blood-vessels. I had been in hopes to save the eye and the patient, but it appears doubtful on account of the rapid reformation of the growths and the glandular infiltrations.

DISCUSSION.

Dr. Knapp.—I would ask Dr. Noyes what was the result in the case which he reported.

Dr. Noyes.—For the four years that my case was under observation there was no return of the growth. Of late years he has passed from observation.

In another case of epithelial growth of the conjunctiva on which I operated there has been no return for six years. The first case was one of melano-sarcoma.

Dr. Knapp.—I have seen a number of these growths which I have removed as carefully as possible, but they have all relapsed, the period varying in different instances.

Dr. Wadsworth.—In two cases of small episcleral epithelioma, one removed by myself, the other seen in consultation, the growth had not returned at the end of several years.

Dr. Randall.—It might not be without interest to mention a case of melano-sarcoma which I referred to Jæger's clinic. The growth was as large as the eyeball, but pedunculated, so that its base did not measure more than four or five millimetres. As the base was gradually getting smaller, I am of the opinion that it eventually might have fallen off. The pre-aural glands were involved and the conjunctiva was blackened in the peculiar manner mentioned.

I have seen two other cases, of alveolar sarcoma with no great amount of pigment, which involved the limbus solely. In a third case both the cornea and conjunctiva were involved.

Dr. Lippincott.—Some years ago, I removed a similar

growth involving the margin of the cornea. The tumor had invaded the wall of the eyeball to such an extent that I deemed it advisable to remove the globe, although vision was almost perfect. Enucleation was accordingly performed, and the disease has not returned.

THE EQUIVALENCE OF CYLINDRICAL AND SPHERO-CYLINDRICAL LENSES.

BY EDWARD JACKSON, M.D.,
PHILADELPHIA.

RECENT discussion as to the use of cylindrical lenses has revealed that some are disposed to employ two cylindrical surfaces where one would be preferable. In view of this, and because the propositions in question are capable of other applications of practical importance, it seems worth while to record the following demonstrations. These demonstrations apply within the same limits and with the same approximation to accuracy, as the demonstrations and formulæ in common use for spherical and cylindrical lenses. That is, the lenses are supposed to be so thin that they may, without serious error, be regarded as superimposed in the same plane; and their spherical aberration so slight that it may be disregarded; while the pencil of incident rays emanates from a point in, or sufficiently near, the principal axis of the lens system.

PROPOSITION I.—*Equal crossed cylinders are optically equivalent to a spherical lens of the same focal length.*[1] If two equal cylindrical lenses C′ and C″ are superimposed with their axes perpendicular to one another, the axial plane of each lens will be perpendicular to the axis of the other. Since a cylindrical lens does not affect the direction of incident rays with refer-

[1] The *axial plane* of a cylindrical lens is the plane which passes through the geometrical axis of the cylindrical surface, and the middle of that surface. The line in which it cuts that surface is called the *axis* of the cylindrical lens. Where cylindrical lenses are superimposed the intersection of their axial planes constitutes the *principal axis* of the lens system. Cylindricial lenses superimposed with their axial planes, and therefore their axes, perpendicular to one another, are called *crossed cylinders*.

ence to a plane perpendicular to its axis, the influence exerted on the incident pencil by each lens with reference to its own axial plane will be the same as though the other lens were absent. C′ will cause all the rays of the incident pencil to pierce its axial plane in a focal line (linear focus) parallel to the plane of the superimposed lenses, and distant F′ from that plane. In the same way C″ will cause all the rays to pierce its axial plane in a similar focal line parallel to the plane of the superimposed lenses, and distant F″ from that plane. But since C′ = C″ we have the focal distances for the same incident pencil F′ = F″. Therefore the two focal lines, being equidistant from the plane of the superimposed lenses and both parallel to that plane, must lie in the same plane; and all the rays piercing both of them must pierce them at their intersection. Hence all the rays of the incident pencil are brought to a single point, just as they would be by a spherical lens. That is, when their axes are perpendicular and C′ = C″,

$$C' \frown C'' = S.$$

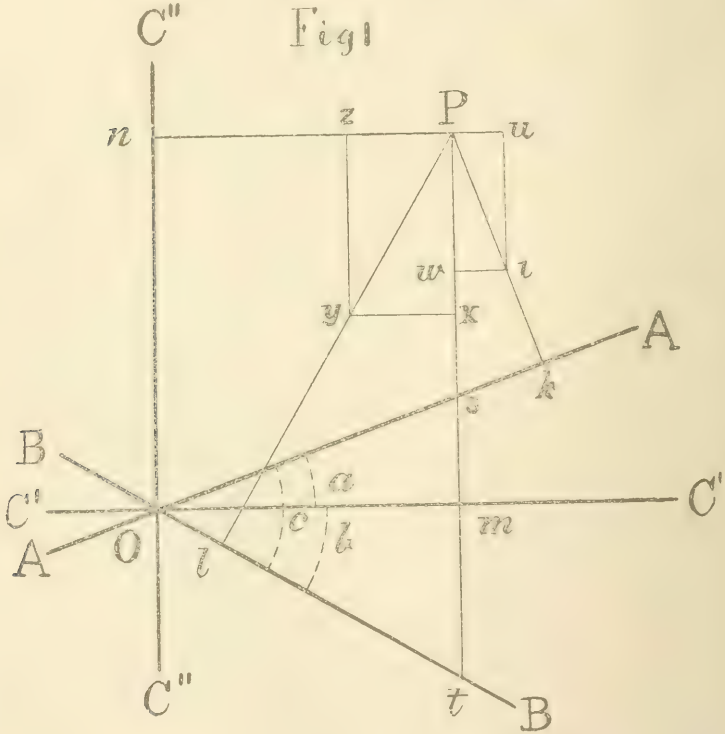
PROPOSITION II.—*Crossed cylindrical lenses of unequal refractive power are optically equivalent to a spherical lens, of the same refractive power as one of the given cylindrical lenses, combined with a cylindrical lens equal in refractive power to the difference between the refractive powers of the given cylindrical lenses.* Suppose C′ and C″ to be such unequal crossed cylinders. Now consider C″ as composed of C_1 and C, both of which have their axes coincident with that of C″; and C_1 having the same refractive power as C′, then

$$C'' = C_1 \frown C \text{ and}$$
$$C' \frown C'' = C' \frown C_1 \frown C.$$
$$\text{But by Prop. I. } C' \frown C_1 = S.$$
$$\text{Hence } C' \frown C'' = S \frown C.$$

The refractive power of C equalling that of C″ minus that of C_1 (= C′).

PROPOSITION III.—*Any two superimposed cylindrical lenses with their axes placed at any oblique angle, are optically equivalent to crossed cylinders of certain strengths with their axes placed in certain directions; and therefore to a certain sphero-cylindrical*

lens. Let Fig. I. represent the plane in which are superimposed any two cylindrical lenses, A and B. Let AA and BB making at O any angle *c* represent the axes of these lenses; and let C′C′ and C″C″ represent the axes of the supposed equivalent crossed cylinders, one of them C′C′ dividing the angle *c* into two parts; *a* adjacent to AA, and *b* adjacent to BB. From any point P at which an incident ray pierces the plane of the superimposed lenses let fall Pk, Pl, Pm and Pn, respectively perpendicular to AA, BB, C′C′ and C″C″; and produce Pm until it cuts BB in t, s being the point in which it cuts AA.



Because their sides are perpendicular, the angle kPs = angle *a*, and lPs = *b*.

Any ray incident at P is, by the lens A, turned from its course, toward the axial plane of the lens. The force which A

exerts, so to turn the incident ray, may be called r', which acts in the direction Pk. If now upon Pk we lay off Pv representing r′, and upon Pv as a diagonal complete the parallelogram P u v w, we obtain a parallelogram of forces in which Pv or r' may be considered the resultant of Pu and Pw acting respectively in the directions Pn and Pm; and by the laws governing such forces Pv may for all purposes be replaced by its components Pu and Pw, acting in the directions Pn and Pm. In the same way laying off Py to represent r'', the force exerted by the lens B upon any ray incident at P, and completing the second parallelogram of forces, it is seen that Py may be replaced by its components Px and Pz also acting in the directions Pm and Pn. Designating the sum of the forces acting in the direction of Pm by R′ and of those acting in the direction of Pn by R″ the condition of optical equivalence is that

$$R' + R'' = r' + r'' \qquad (0)$$

In considering refraction by lenses it is convenient to designate as positive any force which tends to turn the ray toward the axis of the lens; and as negative any force tending to turn the ray from the axis of the lens. Since Pw and Px are both positive,*

$$R' = Pw + Px$$

But as Pu is negative,

$$R'' = Pz - Pu.$$

Since Pm and Pn are perpendicular to one another, Pw v is a right-angled triangle, so that either of the other sides is equal to the hypothenuse multiplied by the cosine of the adjacent, or sine of the opposite angle.

$$Pw = Pv \times \cos v \quad Pw = r' \cos a$$

$$\text{and } wv = Pu = Pv \times \sin v \quad Pw = r' \sin a.$$

In the same way

$$Px = Py \times \cos x \quad Py = r'' \cos b$$

$$\text{and } xy = Pz = r'' \sin b$$

$$\text{Hence } R' = r' \cos a + r'' \cos b \qquad (1)$$

$$\text{and } R'' = r'' \sin b - r' \sin a \qquad (2)$$

* I have taken in Fig. I. the case of A and B both convex, and P outside of the angle *c*; but the same formulæ, with the obviously necessary changes of signs, apply, when either or both of the lenses are concave, or P falls within the angle c.

The refractive power or force (r) of a cylindrical lens at any point may be represented by the distance (d) of that point from the axis of the lens, divided by the focal distance (f) of the lens.

$$\text{Thus } r = \frac{d}{f}$$

Representing by d', d'', D′ and D″ the respective distances Pk, Pl, Pm and Pn, of P from the axes of A, B, C′ and C″; and by f', f'', F′ and F″ the focal distances of these same lenses; we have

$$r' = \frac{d'}{f'} \text{ and } r'' = \frac{d''}{f''}$$

Substituting these values of r' and r'', equations (1) and (2) become

$$R' = \frac{d'}{f'} \cos a + \frac{d''}{f''} \cos b \tag{3}$$

$$R'' = \frac{d''}{f''} \sin b - \frac{d'}{f'} \sin a \tag{4}$$

It remains to be shown that

$$R' = \frac{D'}{F'} \text{ and } R'' = \frac{D''}{F''}$$

for all possible positions of P; and to determine the values of F′ and F″.

In the right-angled triangle Pks, $d' = \text{Pk} = \text{Ps} \times \cos a$.

But $\text{Ps} = \text{Pm} - \text{ms} = \text{D}' - \text{ms}$

and in the right-angled triangle Oms;

$\text{ms} = \text{Om} \times \tan a = \text{D}'' \tan a$

Hence $\text{Ps} = \text{D}' - \text{D}'' \tan a$

and $d' = (\text{D}' - \text{D}'' \tan a) \cos a$

Again in the right-angled triangle Plt

$d'' = \text{Pl} = \text{Pt} \times \cos b$

But $\text{Pt} = \text{Pm} + \text{mt} = \text{D}' + \text{mt}$

and in the right-angled triangle Omt

$\text{mt} = \text{Om} \times \tan b = \text{D}'' \tan b$

Hence $\text{Pt} = \text{D}' + \text{D}'' \tan b$

and $d'' = (\text{D}' + \text{D}'' \tan b) \cos b$

Substituting these values of d' and d'' in equations (3) and (4), we obtain

$$R' = \frac{(D' - D'' \tan a) \cos^2 a}{f'} + \frac{(D' + D'' \tan b) \cos^2 b}{f''}$$

and

$$R'' = \frac{(D' + D'' \tan b) \sin b \cos b}{f''} - \frac{(D' - D'' \tan a) \sin a \cos a}{f''}$$

But $\tan = \frac{\sin}{\cos}$ Substituting and reducing

$$R' = \frac{D' \cos^2 a - D'' \sin a \cos a}{f'} + \frac{D' \cos^2 b + D'' \sin b \cos b}{f''}$$

$$R' = D' \left(\frac{\cos^2 a}{f'} + \frac{\cos^2 b}{f''} \right) + D'' \left(\frac{\sin b \cos b}{f''} - \frac{\sin a \cos a}{f'} \right) \quad (5)$$

and

$$R'' = \frac{D' \sin b \cos b + D'' \sin^2 b}{f''} - \frac{D' \sin a \cos a - D'' \sin^2 a}{f'}$$

$$R'' = D'' \left(\frac{\sin^2 b}{f''} + \frac{\sin^2 a}{f'} \right) + D' \left(\frac{\sin b \cos b}{f''} - \frac{\sin a \cos a}{f'} \right) \quad (6)$$

Equations (5) and (6) being true for all values of a and b, to render R′ independent of D″, and R″ independent of D′, we have only to give a and b such values that

$$\sin 2a : \sin 2b :: f' : f''$$

then $\frac{\sin 2a}{f'} = \frac{\sin 2b}{f''}$

But the sine of double an angle equals double the product of its sine and cosine, so the above becomes

$$\frac{2 \sin a \cos a}{f'} = \frac{2 \sin b \cos b}{f''}$$

and $\frac{\sin a \cos a}{f'} - \frac{\sin b \cos b}{f''} = 0$

The co-efficient of D″ in (5) and D′ in (6) being zero, these equations become

$$R' = D' \left(\frac{\cos^2 a}{f'} + \frac{\cos^2 b}{f''} \right) \quad (7)$$

$$R'' = D'' \left(\frac{\sin^2 a}{f'} + \frac{\sin^2 b}{f''} \right) \quad (8)$$

For any given pair of lenses in a given position, the co-efficients of D′ in (7) and of D″ in (8) are constant, and may be represented thus :

$$\frac{\cos^2 a}{f'} + \frac{\cos^2 b}{f''} = \frac{1}{F'}$$

$$\frac{\sin^2 a}{f'} + \frac{\sin^2 b}{f''} = \frac{1}{F''}$$

from which F′ and F″ the focal distances of C′ and C″ might be easily calculated; and making equations (7) and (8) take the form

$$R' = \frac{D'}{F'} \text{ and } R'' = \frac{D''}{F''}$$

It is evident that no other values of a and b or F′ and F″ will satisfy the above equations; hence C′ and C″ in the position assumed, are the only crossed cylinders that will exactly replace A and B.

$$\text{Since } A \frown B = C' \frown C''$$
$$\text{and (Prop. II.) } C' \frown C'' = S \frown C$$
$$A \frown B = S \frown C$$

PROPOSITION IV.—*Any number of superimposed cylindrical lenses, with their axes placed in any directions, may be optically replaced by a single sphero-cylindrical lens.*

Suppose $C' \frown C'' \frown C''' - - - - - C^n$ to be a series of superimposed cylindrical lenses. By Prop. III. we may get

$$S_{,} \frown C_{,} = C' \frown C''$$

Then combining $C_{,}$ with C‴ we have

$$S_{,,} \frown C_{,,} = C_{,} \frown C'''$$

adding $S_{,}$ we have

$$S_{,} + S_{,,} \frown C_{,,} = S_{,} \frown C_{,} \frown C''' = C' \frown C'' \frown C'''$$

continuing and calling the cylindrical finally obtained C we have

$$S_{,} + S_{,,} - - - - S_{n-1} \frown C = C' \frown C'' \frown C''' - - - - C^n$$
$$\text{and making } S = S_{,} + S_{,,} - - - - - + S_{n-1}$$
$$\text{we have } C' \frown C'' \frown C''' - - - - - - C^n = S \frown C$$

In Proposition III. the values of a and b, and F′ and F″, might be calculated directly from the formulæ given; but an easier way of obtaining them is developed as follows: Designating by $\frac{1}{F}$ the refractive power of C, we have

$$\frac{1}{F} = \frac{1}{F'} - \frac{1}{F''}$$

$$= \frac{\cos^2 a}{f'} + \frac{\cos^2 b}{f''} - \frac{\sin^2 a}{f'} - \frac{\sin^2 b}{f''}$$

$$= \frac{\cos^2 a - \sin^2 a}{f'} + \frac{\cos^2 b - \sin^2 b}{f''}$$

But $\cos^2 a - \sin^2 a = \cos 2a$

and $\cos^2 b - \sin^2 b = \cos 2b$

Hence $\frac{1}{F} = \frac{\cos 2a}{f'} + \frac{\cos 2b}{f''}$

But if $\frac{\sin 2a}{f'} = \frac{\sin 2b}{f''}$

$$f'' = \frac{f' \sin 2b}{\sin 2a}$$

$$\frac{1}{F} = \frac{\cos 2a}{f'} + \frac{\cos 2b \sin 2a}{f' \sin 2b}$$

multiplying by $\sin 2b$ we get

$$\frac{\sin 2b}{F} = \frac{\cos 2a \sin 2b + \cos 2b \sin 2a}{f'}$$

But referring again to trigonometry

$$\cos 2a \sin 2b + \cos 2b \sin 2a = \sin (2a + 2b) = \sin 2c$$

hence $\frac{\sin 2b}{F} = \frac{\sin 2c}{f'}$

$$\sin 2b : \sin 2c :: \frac{1}{f'} : \frac{1}{F}$$

$$\sin 2b : \frac{1}{f'} :: \sin 2c : \frac{1}{F}$$

But $\sin 2a : \frac{1}{f''} :: \sin 2b : \frac{1}{f'}$

Hence $\frac{1}{f''} : \sin 2a :: \frac{1}{f'} : \sin 2b :: \frac{1}{F} : \sin 2c$ (A)

To obtain a, b, and $\frac{1}{F}$ by construction, in general (as Stokes did in the particular case of his lens): From any point O (Fig. 2) draw O L to represent $\frac{1}{f''}$, and O M to represent $\frac{1}{f'}$, making the angle L O M $= 2c$, complete the parallelogram and draw the diagonal O N.

Then in the triangle O N L

$$O\,L = \frac{1}{f''} \text{ and } N\,L = O\,M = \frac{1}{f'}$$

while $O\,L\,N = 180^\circ - 2c$

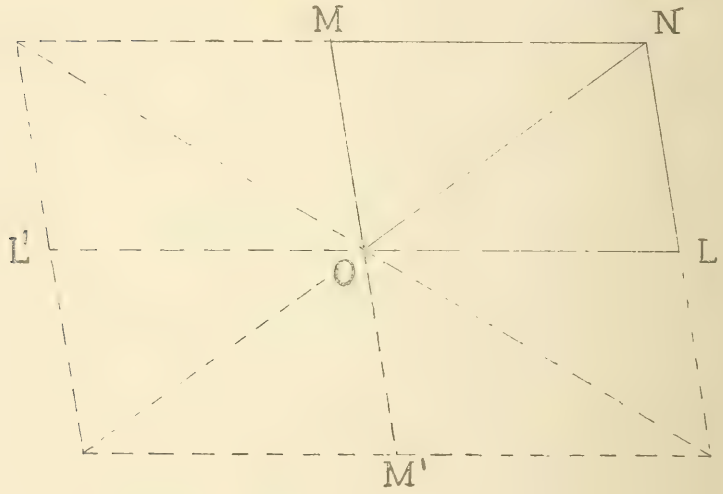
But the

$$\sin (180 - 2c) = \sin 2c\,;$$

and since the sides of the triangle are proportional to the sines of the angles respectively opposite them, we have by (A)

$$O\,N = \frac{1}{F}\,,\ O\,N\,L = 2a,\ \text{and}\ N\,O\,L = 2b$$

FIG. 2.



It is to be observed that when $\frac{1}{f''}$ or $\frac{1}{f'}$ is negative (concave lens) it is to be laid off in the opposite direction, O L′ or O M′, and the parallelogram constructed accordingly.

To obtain the value of $\frac{1}{F''}$, the refractive power of S, we have,

$$A \frown B = S \frown C$$

Now suppose a second series of lenses

$$A^r \frown B^r = S \frown C^r$$

in which A^r is a cylindrical lens of the same refractive power as A with its axis perpendicular to the axis of A, B^r and C^r bearing respectively the same relations to B and C. Adding these series together we would have

$$A \frown A^r \frown B \frown B^r = 2\,S \frown C \frown C^r$$

But by Prop. I. $A \frown A^r = A^s$

A^s being a spherical lens of the same refractive power as A.

In the same way $B \frown B^r = B^s$

and $C \frown C^r = C^s$

But the combination of any number of spherical lenses is equivalent to a spherical lens, the refractive power of which is equal to the sum of their refractive powers.

Hence $\frac{1}{f'} + \frac{1}{f''} = \frac{2}{F''} + \frac{1}{F}$

or $\frac{1}{F''} = \frac{1}{2}\left(\frac{1}{f'} + \frac{1}{f''} - \frac{1}{F}\right)$

To find the sphero-cylindrical equivalent of any two sphero-crossed cylindrical lenses:

1st.—*Construct a parallelogram two adjacent sides of which represent the refractive powers of the given lenses, while their included angle equals twice the angle made by the axes of the lenses, if both are convex or concave; and the supplement of twice that angle, if one be convex and the other concave. The diagonal cutting this included angle, will correspondingly represent the refractive power, and direction of the axis, of the cylindrical portion of the equivalent.*

2d.—*From half the sum of the refractive powers of the given lenses subtract half the refractive power of the cylindrical portion of the equivalent; the remainder will be the refractive power of the spherical portion of the equivalent.*

DISCUSSION.

Dr. Hay.—I have been much interested in the demonstration, which is similar to that which was given to me by Dr. Oliver, now Professor Oliver, of Cornell University. In Donders' book is given the formula for determining the equivalent of Stokes' lens, which consists of two cylinders of equal power, one convex and the other concave, rotated so that their axes make successive angles. I tried to work the formula out, but did not succeed. I mentioned the matter to Dr. Oliver, and he went to the black-board and tried to work it out. The following day he sent me a demonstration, using

a figure similar to that shown by Dr. Jackson. He did not tell me how he did certain parts of it, but I subsequently worked it out in a way a little different from that given to-day. This method may be applied either where the two lenses which you want to combine are both convex or both concave, or where one is convex and the other concave.

There is one other point, on which I would express myself a little differently from the speaker. I should not say that they are perfect equivalents. I should say that the resultants are equivalent for very small pencils. The smaller the pencil, the less error is there in the statement of the equivalence. You might decompose the effect from one cylinder, say C′, into two components, one with reference to $C_{''}$ and another with reference to $C_{'}$; these two components being approximately correct when the pencil is small. It is true for most formulæ that they hold only for small pencils.

DR. JACKSON.—In the beginning of my paper, I stated that this demonstration was only true within the same limits as apply to the optical formulæ in common use; thin lenses, small apertures, and pencils of light originating from points close to the axis of the lens system.

With reference to the position of the axis. If we regard every cylinder as having an axis of greatest and of least refraction, then in a convex cylinder its axis of greatest refraction will be the axis of the cylinder, and its axis of least refraction will be perpendicular to this; in a concave cylinder, the axis of greatest refraction would not be where the refraction of the cylinder is really the greatest, but where there is no refraction at all, that is to say, — R is less than O. In the one case it is where + R is at its maximum, and in the other case where R = O. The general formula will apply by observing the proper signs; and the axis of greatest refraction for the equivalent cylinder will always lie between the axes of greatest refraction of the given cylinders.

DR. DENNETT.—This demonstration was said to be correct for very small pencils of light and thin lenses. This calls to mind the fact that these formulæ are not always correct for the lenses which patients require. Dr. Loring has had some experience in prescribing crossed cylinders for cataract. He gave a satisfactory demonstration to the New York Ophthalmological Society, that the images formed by these crossed cylinders were clearer than the images formed by the equivalent sphero-cylindrical lenses. The difference was so marked that patients insisted upon having their crossed cylinders. And it has long been known that watch makers' magnifying

glasses and some of the best of reading glasses were made of crossed cylinders, on account of popular impression among those using them that they were better. A hurried examination gives one the idea that the field is larger, and that there is not so much distortion at the edges as is seen through spherical glasses of the same size and strength.

Dr. Little.—With reference to the practical side of this question, I went over my case books to ascertain how often I had given crossed cylinders in mixed astigmatism, and how often I had given the equivalent sphero-cylinder. I found that I had given sphero-cylinders in thirty-three cases, and had given crossed cylinders with the angles not at right angles in thirty-five. The reason that I gave crossed cylinders in preference to their equivalent sphero-cylinder was because the patients preferred them. In placing a sphero-cylinder which corrects mixed astigmatism before a patient, you have to be careful that the glass is accurately centred. I have in mind a case which I corrected seven years ago, using a sphero-cylinder for one eye and crossed cylinders for the other. Where the crossed cylinders were used, there was a slight corneal opacity, and better vision was obtained. There is a practical advantage, but I am not quite convinced why it is.

A case recently presented itself with cataract in one eye and high astigmatism in the other. A minus cylinder at 90°, brought vision up to $\frac{20}{30}$; a + cylinder added at 45°, gave $V = \frac{20}{20}$. I am not prepared to mathematically demonstrate what I believe, but I know that patients will many times select crossed cylinders in preference to their equivalent in sphero-cylinders.

THE AMBLYOPIA OF SQUINTING EYES: IS IT A DETERMINING CAUSE, OR A CONSEQUENCE OF THE SQUINT?

By SAMUEL THEOBALD, M.D.,

The question whether the amblyopia which exists in the squinting eye in so large a proportion of cases of concomitant convergent strabismus is a consequence of the squint, or whether it antedates it, and is an important factor in deter-

mining its development, is one not of mere theoretical interest, but of practical importance; for upon its solution depends the further question, whether the operative correction of this deformity shall be undertaken at the earliest moment possible after it has become established, or whether it may be postponed, without detriment to the result, to a later period of life. If the views of Schweigger and of Alfred Graefe, that the amblyopia is a congenital defect, and not a result of the squint, be correct, it is a matter of little moment when the operation shall be undertaken; but, on the other hand, if, as was commonly held before the promulgation of their views, the amblyopia is produced by the squint, in consequence of the habitual negation of the retinal image in the squinting eye, then the question of time is an all-important one, since the success of the operation depends to so great a degree upon the amount of sight retained by the squinting eye at the time of its performance.

The facts which these distinguished authorities have cited, and the arguments which they have advanced, to sustain their views, do not appear to me to be at all convincing, and though the same criticism doubtless applies in a measure to all that can be said in support of the older doctrine, still I cannot but think that the weight of evidence is decidedly in its favor. It has seemed to me, therefore, in view of its practical bearing, that the question which this paper brings up is one which ophthalmologists might discuss with profit.

It is customary to speak of the amblyopia of squint as "*amblyopia ex anopsia*," and to place it in the same category with the amblyopia which results, in young persons especially, from the long-continued existence of lenticular or corneal opacity; but this is clearly a mistake, for if the impaired vision be in any sense the result of the squint, it is certainly not due simply to want of exercise of the retina, as is the case with opacity of the media, but to a cerebral process which gives rise to a much more rapid failure of sight, and the outcome of which is better described as a loss of perception in the corresponding cerebral centres, than as an amblyopia of the

eye, as Nettleship has suggested.[1] Alfred Graefe, himself, admits this difference, and yet, realizing, apparently, the unconvincing character of the evidence by which he attempts to sustain his position, he permits himself to use as an argument against the theory that the amblyopia is produced by the squint, the well-known fact that in monocular cataract the exclusion of the retina from participation in vision, even for many years, does not usually (in adult life) result in impairment of its function.

Both Schweigger and Alfred Graefe[2] reject Mueller's theory of congenital retinal identity, and evidently think that by doing so they greatly strengthen their position. I cannot see, however, that such is the case; for, since convergent squint is scarcely ever congenital, and is only rarely seen in early infancy, there is every reason to believe that, whether this fundamental principle of binocular vision—the correspondence of identical retinal points—be an inherited or an acquired law, it is in operation during the pre-squinting years of life; otherwise there would be from the first no stimulus to binocular fixation, and the development of squint in infancy would certainly be the rule, and not the rare exception that it is.

Again, they both refer to the fact that in some cases of non-alternating squint of years' standing, the squinting eye retains vision which is nearly or quite as good as that of the other eye; while in other cases a high degree of amblyopia is found in squints of very recent development; and this, they think, militates against the view that the squint induces the amblyopia. In reply to this, it may be said that, as a rule, the impairment of vision is certainly greater in squints of long standing than in those of short duration; in the next place, that the non-development of amblyopia in exceptional instances is easily explained without the necessity of abandoning the suppression theory, a marked difference in the refraction of the eyes being competent to produce this result, because the indistinct retinal image which the squinting eye receives under

[1] Diseases of the Eye, American edition, p. 238.

[2] See article upon Strabismus, by Alfred Graefe, in Graefe and Saemisch's Handbuch, vol. vi., and the chapter upon the same subject in Schweigger's Handbuch der Augenheilkunde.

such circumstances causes less confusion, and is, therefore, less apt to be suppressed; and, in the third place, that the development of the amblyopia doubtless begins during the forming stage of the squint, while it is yet unconfirmed, each movement of excessive convergence being accompanied by an effort to get rid of the attendant diplopia, so that it is not at all remarkable that in some instances the impairment of vision should reach a high grade by the time the squint has become fully established; and, furthermore, if this were not the case, who, it may be asked, is in a position to affirm that the alterations of cerebral structure which cause the impairment of vision may not take place within the space of even a few weeks?

Schweigger asks, why we usually have diplopia in paralytic squint and not in concomitant squint, and finds a satisfactory answer in the assumption that in the former retinal identity or coördination has been *acquired;* in the latter it has not been. To my mind, a much more satisfactory answer is, that paralytic squint occurs suddenly, and is usually met with in adults, whereas concomitant squint develops slowly, and almost always commences in childhood. In the former, therefore, we have annoying diplopia, because there has been no incipient stage during which the individual has been learning to suppress the image formed in the squinting eye; in the latter, this faculty, as has been said, is already acquired by the time the squint is fully formed, so that double vision is rarely complained of. Moreover, it is to be remarked that amblyopia from suppression develops more rapidly in children than in adults, and that even when diplopia is present in the early stages of concomitant squint, it is apt to escape our notice, because in children such visual disturbances cause much less annoyance, and are less apt to be complained of, than in adults.

Again, Schweigger urges that the "suppression theory" demands that the image in the squinting eye shall be always and continually suppressed in order to prevent diplopia, but that he has satisfied himself that this is not the case, for he has met with persons in whom it was impossible to produce

diplopia, but who, nevertheless, while fixing an object with the good eye in a dark room, saw the image of a candle-flame whenever, by reflection, it was caused to fall upon the yellow spot of the squinting eye. As I understand the suppression theory, it claims that in the beginning there does occur an active exclusion or suppression of the image produced in the squinting eye, but that in time, in consequence of this process, structural changes take place in the corresponding visual centres, and that, henceforth, we have to do not with an eye which can see, but by an active effort refuses to see, but with one which cannot see though it would; and furthermore, that when this active process has produced such a degree, and such a kind of amblyopia, as shall do away with the discomforts of double vision, its purpose is accomplished, and it probably ceases to be operative, and as the attainment of this end does not require that there should be loss of light perception in the region of the yellow spot, so great an impairment of vision as this is not to be expected, and, as a matter of fact, is scarcely ever met with. I cannot admit, therefore, that this experiment of Schweigger's has any significance, or that it tends in the smallest degree to disprove the truth of the "suppression theory."

The absence of diplopia in concomitant squint Schweigger explains, as has been mentioned, by assuming that binocular vision (retinal identity) has not been acquired, or, if acquired, has been forgotten; but, as Noyes and others have pointed out, this explanation is not satisfactory, because in many cases in which under ordinary conditions double vision is absent, it can be produced by causing the image of the object looked at to fall upon a different portion of the retina of the squinting eye by means of a prism.

Schweigger makes a seemingly strong point when he states that no one has ever proved that an eye which once saw well has become amblyopic after the occurrence of squint; for, if the "suppression theory" be true, it is exactly this which does happen in most cases of concomitant strabismus. I cannot believe, however, that he has warrant for so sweeping a statement. Possibly he could find no such cases recorded in

medical literature, and this is not so remarkable in view of the comparatively small consideration which this subject has received at the hands of modern writers; but that there are scores of cases recorded in the note-books of ophthalmic surgeons in which there has been observed a progressive decline in the vision of squinting eyes, I do not for a moment doubt. Roosa, in his recent paper upon "The results of the operation for convergent squint,"[1] reports one case, at least, of this character. It is to be borne in mind, moreover, that it is always extremely difficult, and often impossible, to ascertain with any degree of accuracy the acuity of vision of very young children, and that when the eye to be tested is a partially amblyopic and squinting one, the difficulties of the task are immensely increased. It is not to be wondered at, then, since the majority of concomitant squints develop, probably, before the sixth year of life, that there should be a paucity of evidence as to the relative acuity of vision of eyes before and after they have learned to squint.

Schweigger's statement that only thirty per cent. of squinting eyes exhibit amblyopia is, I think, scarcely in accordance with the facts; certainly my own experience does not confirm this.[2]

If we turn now to the other aspect of the question, and ask what evidence there is in favor of the view that the amblyopia is produced by the squint, we shall not find the "suppression theory" so devoid of sustaining testimony as Graefe and Schweigger would have us believe.

In the first place, the character of the amblyopia which we find in squinting eyes is significant. If we ask ourselves what must be the chief sources of annoyance to an individual who has just begun to squint, after having previously enjoyed good binocular vision, we shall find that he has two especial difficulties to contend with—one, the doubling of every object upon which he fixes his attention, in consequence of the false position of the retinal image of this object in the squinting

[1] MEDICAL NEWS, Feb. 6, 1886, vol. xlviii. No. 6, pp. 141 et seq.

[2] The sight of the squinting eye is below that of the other in about eighty per cent. of the cases (in which the vision is given) reported by Dr. Roosa in the paper referred to above.

eye; the other, the confusion of vision which results from the images of *different* objects falling upon *corresponding* retinal points, especially in the region of the yellow spots. To get rid of these annoyances he has a twofold task to accomplish :— to eliminate the diplopia, he must teach that portion of the retina of the squinting eye that habitually receives the false image of the object which he looks at not to take cognizance of this image; to prevent the image of some object which he is not regarding from being (mentally) superposed and fused with that of the object which he is regarding, he must ignore all images formed upon the yellow spot of the squinting eye. The successful accomplishment of this task will result in the production of an amblyopia in the squinting eye, which will be regional in character, being most marked in the neighborhood of the macula and over that portion of the retina which receives the false image (so called) of objects regarded by the other eye, and least developed, or altogether absent, in the peripheric parts of the retina which are not concerned in the common visual field. Now, as a matter of fact, does the amblyopia which we find in squinting eyes exhibit these peculiar characteristics? for, if it does, it affords the strongest possible evidence, of itself almost conclusive, that it has been produced by the squint, and that it is not a congenital defect, since such characteristics would be exactly what the one hypothesis would lead us to expect, whereas they would be utterly inexplicable in accordance with the other. I need scarcely say, what every one knows, that its features are, indeed, just such as I have described, central vision and that which corresponds with the part of the retina upon which the false image falls being especially bad, while peripheric vision, in the direction in which we should expect it to be best, is so good that, as Schweigger, himself, testifies, it helps materially the sight of the individual by enlarging his general field of vision.[1]

[1] Schweigger mentions, as a further proof that the squinting eye is used for vision, that strabismic individuals do not have the same difficulty in estimating distance as monoculars; but I am inclined to question the accuracy of this observation; at least, I cannot, in accordance with any theory of binocular perspective with which I am familiar, comprehend how such could be the case.

Again, the fact that such a monocular amblyopia as we find in squinting eyes, without structural changes distinguishable with the ophthalmoscope, is almost never met with except in strabismic individuals, indicates decidedly that when it occurs under such circumstances it is produced by the squint; for, if it were a congenital defect of such common occurrence as to be a frequent factor in the production of strabismus, it could hardly happen that we should not meet with it quite often in individuals who do not squint. In testing for glasses, especially, it should not be a rare experience to encounter it. That it is, however, an extremely rare occurrence, I think all will agree. Schweigger, it is true, claims to have met with a large number of such cases, but I cannot help thinking that in many of these complicated errors of refraction, which it had not been practicable to work out, were the real cause of the imperfect vision.

The almost immediate restoration of binocular fixation which we frequently see after successful operations for squint, when the amblyopia has not reached too high a grade, is another circumstance which favors the exclusion theory, or, at least, militates strongly against the theory of non-acquisition of retinal identity and the correlated doctrine of congenital amblyopia; for, assuredly, if there had been a failure to establish retinal identity in the first years of life (supposing, for the sake of the argument, that it is an acquired, and not an inherited law), it would be absurd to believe that in later years it might be acquired within the space of a few days.

The theory of congenital amblyopia has doubtless received more general acceptation than would otherwise have been the case, because there are many who think that it affords a more satisfactory explanation of the development of concomitant squint than had been offered previously. While recognizing that a monocular amblyopia would greatly facilitate the development of a squint, if the other conditions favorable to its formation were present, I cannot agree with those who think that Donders's explanation of the origin of convergent squint is insufficient or unsatisfactory. In my opinion, if there be one fact in ophthalmology well established, it is that concomi-

tant convergent strabismus is "chiefly dependent upon hypermetropia."[1] Because hypermetropia is (almost without exception) the essential factor in the production of this variety of squint, it does not follow, as some would have us believe, that all hypermetropic individuals must necessarily be strabismic. That hypermetropia is a far more common condition than convergent squint, Donders fully recognized, and his explanation of this fact—of why some hypermetropes squint, and many others do not—is, to my mind, entirely satisfactory.[2]

In conclusion, I would suggest that, until more convincing evidence is adduced in favor of the congenital amblyopia doctrine than has yet been brought forward by its advocates, it will be judicious for us, in the clinical management of cases of concomitant strabismus, to act upon the older theory—that the squint is the cause of the amblyopia—and, therefore, to give our patients the benefit of the promptest surgical interference.

DISCUSSION.

Dr. Noyes.—I do not wish this paper to pass without remark. I differ from its conclusions in toto. There is not one conclusion which I do not absolutely dispute. This is founded upon an experience and careful observation of a number of years. I have listened to only the last few pages of this paper. The author assumes that squinting patients, before the period of squint, have had binocular vision. There is no proof of that, and all the evidence is against it. In the second place, he declares that monocular amblyopia, without lesions visible with the ophthalmoscope and unaccompanied by squint and presumably of congenital origin which are seen at an early period of life, are rare. This is a vital point in the whole discussion. I have a number of cases in my records, of patients with monocular amblyopia, presumably of congenital origin, without lesion demonstrable with the ophthalmoscope, that have no squint, but they may or may not have hypermetropia. Binocular fixation after operations for squint is not infrequently obtained. As regards the frequency with which binocular vision is attained, my experience is that it is attained in about twenty per cent.

[1] Compare the paper of Dr. Roosa's referred to above.
[2] Accommodation and Refraction of the Eye, pp. 294 et seq.

I think that another thing is true as bearing on this question. When you operate for squint in a case where vision is defective, it is rare that the amblyopic eye subsequently improves in vision. I make that assertion without fear of successful contradiction. Many will assert to the contrary; but I think that they found their statements on incorrect observation. It is founded rather on the vague statements of the patients that they see better. If a careful note is made from three to six months after operation, it will rarely be found that visual acuity is increased. The characteristic is that there is a central or para-central scotoma. It is difficult to make this out, for the power of fixation is bad. A thorough discussion of this paper this morning is impossible.

DR. WADSWORTH.—As our remaining time is so short, I will say but a few words in connection with this paper. I agree with what Dr. Noyes has said. Some ten years ago I convinced myself that the amblyopia of squinting eyes was not due to disuse. I thought then that I was alone in that view. But on looking up the literature I found Schweigger had stated the same thing several years before, and that Alfred Graefe, whose paper in Graefe-Sæmisch had just appeared, had become a convert to Schweigger's view. One of the things which led me to the investigation of the question was the observation of one or two cases of children eight or ten years of age, in whom I saw squint begin and become permanent shortly after phlyctenular keratitis had impaired vision in one eye.

From my own observation I feel quite sure that monocular amblyopia without ophthalmoscopic signs, and often with a partial central scotoma, that is, with vision comparatively poorer at the centre than toward the periphery, is not at all uncommon in persons who have never squinted.

At the age at which squint usually commences it is generally impossible to demonstrate monocular amblyopia. But with children still too young to have learned their letters, yet in whom squint has recently appeared, it may sometimes be detected with reasonable certainty by covering the good eye and asking the child to name objects held at a distance. Under such circumstances it is not infrequent to see the child, so soon as it tries to see, draw the head to one side and try to bring the eye from under the cover, while no such effort is made when the poorer eye is covered. And the child names the object more readily, or only, when using the non-squinting eye. Such behavior is, I think, fairly reliable evidence that in [illegible] eye is comparatively poor.

Again, by no means every squinting patient is amblyopic in the squinting eye, and that also is evidence against the theory of amblyopia ex anopsia.

I have never seen satisfactory evidence that vision was improved in squinting eyes after operation. That it is sometimes supposed to be is not always due simply to the fact that the statement of the patient is taken, but also to the fact that the examination has not been made with sufficient care before the operation. Much patience and time must often be devoted to get the full amount of vision of the squinting eye.

Dr. Harlan.—It has been my experience that after operation there has been no appreciable improvement in the squinting eye. The reason of this may be that the patient continues to give preference to the eye which he was accustomed to use before the operation. In a number of cases, particularly in young children, I have attempted to force the patient to use the eye, by keeping the fixing eye under the influence of atropia, sometimes for months at a time. Where the amblyopia is of high degree, the patient will persist in using the fixing eye. In some cases I have succeeded in improving vision in the amblyopic eye. I have no statistics to offer, but I recall one interesting case, in which after months of treatment in this way, the vision in the amblyopic eye increased from $\frac{20}{200}$ to $\frac{20}{50}$. A year or two later, the axes having become normal, this vision was retained.

In regard to amblyopia without change in the ophthalmoscopic appearances, and without squint, I have in certain cases found that strabismus has existed many years before, and has been relieved spontaneously.

Dr. Mittendorf.—Squinting eyes have to be divided into two classes; one in which there is only impaired vision and refractive errors, the other in which we have excentric vision and marked amblyopia. We all have seen cases where there has been an immediate improvement of vision without glasses after an operation, and where there has been eventually great restoration of sight. Such cases might possibly be classed among the cases of amblyopia ex anopsia, and belong to the first class. The immediate improvement is to be explained by the fact that in the squinting eye there must be undue pressure on the eye-ball from the action of the internal and external recti; the pressure differing from that which is exerted by the superior and inferior recti. This being relieved, the eye is placed in a more favorable condition, and we should expect better vision. In the other class, which includes the eyes where there is a central scotoma, very little, if any, im-

provement of vision can be expected after an operation. These are the cases of congenital amblyopia.

DR. THEOBALD.—I shall say only one or two words in reply. I regret that Dr. Noyes was not present at the reading of the early part of the paper, as I considered the arguments to which he has referred. He says that he has little doubt that the amblyopia is frequently congenital. The point which I made in reference to this is that if the amblyopia were present at birth, then we should expect to have convergent squint develope early in life, as there would be from the first no stimulus to binocular fixation. Instead of this, the squint usually comes on when the child begins to read. I think that is a strong argument against the view that the amblyopia is congenital.

In regard to what Dr. Noyes has said, that he has frequently observed amblyopia in non-squinting eyes, and with no explanation of the amblyopia, except that it was congenital; if the statement is a fact it should carry great weight. I can only say in reference to this statement, as to that made by Schweigger, that it does not agree with my own experience, and I am inclined to think that in many of these cases the imperfect sight is due to a high degree of refraction error which has not been accurately worked out. Again, a high degree of monocular astigmatism or a marked difference in the refraction of the eyes would give indistinct vision in one eye, and it is possible that we might get suppression of the retinal image in the more ametropic eye, and as a result monocular amblyopia.

In regard to the restoration of binocular vision after operation, I believe that it is common for this to reappear. I have not used the stereoscope, but have employed a simple test which has convinced me that I have binocular vision. When we get a satisfactory result in strabismus, if the amblyopia is not of too high a degree, if we cover the eye which formerly squinted, we will usually find there is still a balance of power in the internal recti. When we cover the former squinting eye and direct the patient to fix with the other eye, the eye which formerly squinted turns in. When, however, the cover is removed, it turns out, and it is evident that it does so for the purpose of getting the image of the object on a corresponding portion of the retina. To my mind this is conclusive evidence of the restoration of binocular vision. With the stereoscope such an eye might not show binocular vision; for when an eye has been in the habit of squinting, a slight disturbance in the relation of the muscles,

such as a stereoscope produces, will cause it to turn one way or the other.

In regard to the improvement or non-improvement of vision after operation, my experience agrees with that of Dr. Noyes and Dr. Wadsworth, that where there is a considerable degree of amblyopia, there is no appreciable improvement of vision. That of course does not prove one thing or another, whether the amblyopia is congenital or from suppression.

Dr. Noyes speaks of the amblyopia being central or pericentral. That is exactly what the suppression theory would lead us to expect. We should expect the amblyopia over that portion of the retina which receives the double image. I should like Dr. Noyes to explain why the amblyopia presents these peculiar characteristics, unless it is the result of suppression. Why is it that we have pronounced central amblyopia, while the inner portion of the retina which does not join in binocular vision retains such excellent vision? This exactly tallies with the suppression theory, but it is inexplicable on the congenital amblyopia theory. In the latter case there should be a general amblyopia not presenting these characteristics. This one fact,—the peculiar characteristics which the amblyopia of squinting eyes exhibits,—is almost conclusive evidence that it is not a congenital defect.

A CASE OF SUBLUXATION OF THE LENS, WITH DOUBLE RUPTURE OF THE CHOROID. RECOVERY, WITH GOOD VISION.

By B. ALEX. RANDALL, M.D.,
PHILADELPHIA, PA.

JOHN C——, aged twelve, presented himself at my clinic at the Children's Hospital, May 17, 1885, his left eye having been injured by a blow from a heavy chip of wood some hours previously. The lids were somewhat contused and œdematous, and there was a laceration of the outer canthus extending the palpebral fissure outward 5 or 6 mm., its edges in good approximation. A cut of the left side of the nose near the bridge indicated by its direction the line of flight of the chip, and that its impact upon the eye was a glancing one—passing

obliquely up and outward. The conjunctiva was much congested and the cornea superficially hazy, with circumcorneal injection. The anterior chamber contained blood at its lower part, and the aqueous seemed blood-stained. The iris appeared greenish (that of the other eye being grey, and the boy quite blond), the pupil was irregular, large medium, immobile, and widest outward; and the outer portion of the iris seemed pressed forward. No tremulousness of the iris was at this time noted, although this was soon after distinct, especially in the inner portion. T. apparently normal. Atropine had been instilled by the house-surgeon earlier in the day, without, however, changing the condition of the pupil. Vision was reduced to quantitative perception of light, and there seemed to be imperfect projection. No details of the fundus were visible, but there was an unduly whitish reflex from the temporal eye-ground suggestive of retinal detachment. The lens appeared to be in nearly normal position—its margins nowhere visible and its substance showing no opacities. There was little pain or tenderness. Atropine was instilled and a pressure-bandage applied; a purgative was given and rest enjoined, and he was ordered to report daily from his home near by, for examination and dressing.

Three days later the eye was less irritable and injected,—the iris of more normal color, slightly tremulous,—the reflex from the fundus was more distinct, with no evidence of retinal detachment, and the field seemed normal. Fingers could now be counted at one metre.

A week after the injury the eye was nearly quiet. The lens was unmistakably subluxated, and its inner-upper margin visible; and the iris was more tremulous, its outer portion still apparently pressed forward by the dislocated lens. The fundus was now visible, and lesions before surmised were unmistakably seen. A rupture of the choroid, constituting a circular arc of 70°, nearly concentric with the disk, was visible a little outside of the macular region. It was some five disk-diameters in length, and gaped in some places as much as half the breadth of the disk. The glistening sclera was visible throughout its length, although obscured at some points by

remains of extravasations. The margins were generally yellowish, and here and there outlined by pigment heaps. Close to the temporal margin of the papilla was another rupture, extending upward from a point one diameter below the outer margin of the disk, concentrically with its border, to be lost above the disk in a rounded area of choroidal inflammation. This area embraced the upper and inner margins of the nerve, was at first sharply defined through most of its extent, and with the rupture, which extended into it, formed a figure like a comma. It was strongly yellowish throughout, and showed by the uncovered vessels and the scattered pigment clouds a commencing atrophy of the choroid. The pigment was, however, in part at least, anterior to the retinal vessels. There was no evidence as to the retina having been anywhere torn; its vessels were only somewhat tortuous, and in places veiled by haze. The eye was myopic and highly astigmatic, being best seen with a concave cylinder glass of about 5 D., axis vertical.

The mydriatic and compress were continued for several weeks, during which the eye steadily progressed towards more normal conditions. The inflammatory state of the choroid passed away; but the area of change increased considerably in extent, and the absorption and heaping-up of the pigment advanced. The macular rupture narrowed until no sclera could be seen, and the pigment deposits grew denser and more extensive. The tear near the disk closed less, while its pigmentation was rather more marked. The corneal haze disappeared and the astigmatism grew less, making the eye-ground easier of study; and vision markedly improved. The pupil remained irregularly dilated long after the mydriatic was discontinued, and responded but slightly to light or to eserine.

At present the pupil is still small medium and vertically oval, but responds fairly to light. The iris corresponds to its fellow in color, and the anterior chamber is nearly normal in depth, but its inner part may be slightly deeper and the iris is tremulous. The rent in the macular region is closed; the choroid seeming thin in places, but entire; and it looks as if in time nothing but the pigmentation will be left to mark its

site, and this seems less than it was. The rupture at the disk is less perfectly healed, but might be mistaken for a peculiar conus. The area of choroidal change is still more extensive, embracing all but the temporal border of the disk, and fading out into the general lightly pigmented eye-ground; but the original area is almost wholly atrophic between the vessels. The disk seems rather greyish and its vessels are small. The limits of the field are not narrowed, but the damaged areas appear as partial scotomata for colors, and perhaps for form. The eye shows only a slight hypermetropic astigmatism. The vision is $\frac{6}{12}+$ on the metric card, not increased but sharper with glasses. Jæger No. V. can be read by the unaided eye at 25 cm.; and with $+3$ D. Jr. No. I. is easily read from 12 to 30 cm. The right eye has low H.As. with V. $= \frac{6}{6}$? Jr. I. p.p. 13 cm., and with $+3$ D. p.p. 6 cm. He is comfortable at work, the visual axes are parallel, and he notes no diplopia or other trouble. The sketches submitted represent the appearances about two weeks after the accident and at the present time, eight weeks later.

In view of the extent of the injuries here suffered, the completeness of the recovery seems very notable. The return of an eye, after such interference with the lens, to an approximately *emmetropic* condition, and the regaining of about 5 D. of its total 11 or 12 dioptrics of accommodation, were results wholly unexpected. This, with the peculiarity of the lesion near the disk, where the force was able to give a twist, as it were, to an area of the choroid without extending the rent through it, seem to render the case worthy of being laid before the Society.

Randall del. F. Moras lith. Phil.

A CASE OF MULTIPLE RUPTURE OF THE EYEBALL, WITH PARTIAL DISLOCATION OF THE LENS INTO THE ANTERIOR CHAMBER.

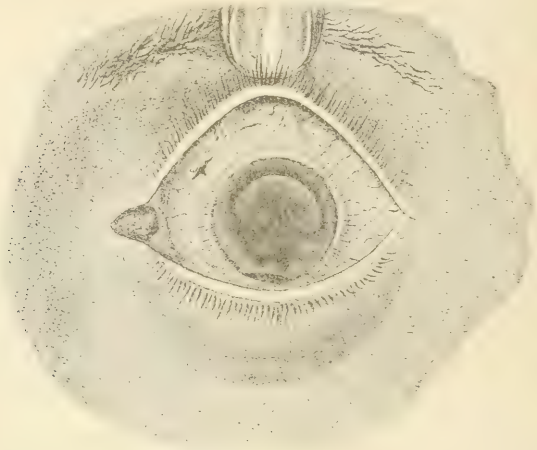
RECESSION OF LENS, AND RECOVERY WITH SOME VISION.

By B. ALEX. RANDALL, M.D.,
PHILADELPHIA, PA.

OLIVER A——, aged fifty, stockingweaver, English, was sent to my clinic at the Episcopal Hospital, March 17, 1885, suffering from the results of a severe concussion of the region of the left eye. While rapidly descending a flight of steps the previous evening, he had struck against a projecting end of a piece of board, unseen in the darkness, receiving a blow that had half stunned him by its violence.

The eyelids showed marked ecchymoses and infiltration, which had, however, been reduced by cold applications; but no wound. The conjunctival and ciliary injection was considerable, with some chemosis. In the upper inner ciliary region, 2 mm. from the apparent margin of the cornea, inspection showed a subconjunctival rupture of the sclera, of irregular stellate form, about 3 mm. in its greatest length. There was some prolapse of pigmented tissue filling it, and the conjunctiva over it was raised into a slight prominence by clear fluid. Evidences of other ruptures of the sclera on the upper aspect of the globe were faintly discerned, obscured by the conjunctival infiltration. The cornea was superficially hazy and roughened, but permitted a view of the underlying parts. A clot of blood extended obliquely down and out through the anterior chamber from the vicinity of the ciliary wound, and there was a small layer of precipitated blood at the bottom of the chamber. The iris appeared discolored and greenish, probably by reason of the blood-staining of the aqueous, and was immobile—possibly influenced by the atropia-solution which had been used some hours before. The pupil seemed

larger above and the upper half of the lens projected through it into the anterior chamber, the lower half being in normal position and its zonule probably unruptured. The exact position of most of the lower pupillary margin was hidden by the blood-clot. Vision was reduced to the counting of fingers



at one foot, and the nasal field seemed lost. The ophthalmoscope showed some faint scattered opacities in the lens and only a smoky red reflex from the fundus. The tension was subnormal, and the ball tender to the touch; pain had been severe, preventing sleep, and was still considerable.

The serious nature of the injury being explained to him, the extraction of the dislocated lens was advised. He asked for delay as the vision seemed to be increasing, probably from subsidence of the extravasations; so he was admitted to the House—rest in bed, a purgative, the free use of atropine and leeching were ordered, with iced compresses if the pain should increase.

Comparative comfort followed, and no change was noted, until two days later my colleague, Dr. Heyl, examining him with reference to the advisability of extraction, found no trace of the forward dislocation of the lens. The following day I found the anterior chamber of nearly normal depth and almost free of blood—the iris slightly tremulous, immobile, but of nearly the same color as its fellow—the pupil large medium,

vertically oval and slightly irregular. The lens showed the same scattered opacities as before, and seemed inclined to fall a little backward; but its margin could nowhere be seen, and the fundus was still hidden by the clouds in the vitreous. Vision had improved and the field seemed entire. The edges of the scleral rupture in the ciliary region were in good apposition, as were those of a second tear, higher up and about 6 mm. from the limbus; both showed pigmented tissue within their lips, but there was no hernial protrusion. A third rupture near the equator of the globe and a little external to the vertical meridian was now readily distinguished; it gaped somewhat and the conjunctiva above it was lifted in a clear circumscribed prominence by an elastic material reducible by pressure, doubtless a hernia of vitreous. Rest in bed, with atropia and a light compress bandage, was continued. He was allowed to go home after four weeks; and although unable for some weeks to occupy himself actively without bringing on pain, he was fairly comfortable with a light compress, and improvement, if slow and fluctuating, still advanced.

He returned to his knitting-work about two months after the injury, and a month later presented himself for examination with the eye quiet and free from pain, the ruptures healed and almost invisible, the pupil small medium, vertically oval, but fairly active. Vision $\frac{5}{10}$ with Burchardt's dots, and the field entire. The opacities in the lens were little if at all denser, though apparently more general; the vitreous was full of dark floating shreds, and no details of the fundus were discernible.

The lens has since become rather more moveable, falling lower and further backward than ever before, with slight increase in its opacity, and he has had attacks of pain and dim vision, apparently related to returns of malarial trouble. Vision is variable, but generally about $\frac{1}{10}$ on the metric card. The uninjured eye has remained comfortable, and with no trace of sympathetic involvement.

The principal interest of the case seems to be the spontaneous recession of a lens half dislocated into the anterior chamber.

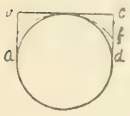
REPORT OF TWO HUNDRED AND SIXTY-ONE CASES OF CATARACT EXTRACTION.

BY GEORGE STRAWBRIDGE, M.D.,
PHILADELPHIA.

FORTY of these operations have been previously reported (vide Phila. Med. Times, Feb. 19, 1876). The remaining two hundred and twenty-one operations have not been reported, and were made by the upward modified corneal flap method.

Description of the modified corneal flap operation:

INCISION.—Erect two perpendiculars *ab* and *dc* (vide wood cut), tangents to the cornea at its horizontal diameter; join these above by a line tangent to the cornea at its upper border, *bc*. Select two half way points on these vertical lines as points of puncture and counter-puncture, with the centre of the incision a tangent to the upper border. This will give an incision of about 11 mm. in extent and in the corneal tissue with the exception of the small scleral flaps at the points of puncture and counter-puncture, and the height of the flap *ef* being about 2.75 mm. makes this a compromise between the corneal flap and the Graefe linear operation, and thus lessens the risks incident to either.



The iridectomy and opening of the lens capsule do not differ from the Graefe operation. The lid speculum being often removed at the completion of the corneal incision if the patient showed great anxiety, the lids being then kept open by the fingers of the assistant.

The lens removal in many of these operations was accomplished by upward inward pressure with a Daviel spoon on the cornea, at the junction of the middle and lower thirds, but latterly I have preferred, after removal of the speculum, to exert a similar pressure by the index finger on the lower lid, thus avoiding rubbing of the corneal epithelium.

At completion of the operation both eyes were closed by compresses and a bandage, and patient placed in bed. After-treatment :—If the patient rests quietly without pain, the eye is not disturbed for twenty-four hours, at which time the compresses are changed. The eye being washed out (latterly with a 2 p.c. sol. of boracic acid) a drop of a 4 gr. solution of atropia is applied and bandage replaced. This proceeding is repeated once or twice a day as circumstances indicate.

My practice formerly was to insist upon perfect quiet in a horizontal position in a darkened room. Further experience would lead me to believe that this was a mistake, and at the present time I make it a rule that the patient shall be absolutely comfortable ; change of position (with the nurse's aid) is freely allowed ; the room in many cases is not even darkened (particularly has this been the case in the hospital operations), except at the time of dressing the eye, and I am sure that this has been a great advantage to the health and good humor of both patient and nurse. As cataract operations generally concern the aged and infirm, I am careful to make the food as nutritious as possible ; whiskey and quinine are frequently given, and a large choice of food is allowed.

During the past year, acting on the plan that the course of life of the aged should be changed as little as possible, I have frequently allowed (with assistance) the patient to sit up in bed twenty-four hours after the operation, on the second day to be moved to a chair, and on the third day a gentle walk about the room is allowed. I am inclined to believe that any risk that may be run by this plan is much less than the debilitating effects of a recumbent position in bed continued for a number of days.

In regard to antiseptic dressings. Three-fourths of these cases had no such treatment. With the remainder a 2 p.c. solution of boracic acid was used as a wash at the time of dressing the eye. I cannot say that I place much importance on its use.

No.	NAME	AGE.	QUALITY AND DURATION OF CATARACT.	COMPLICATIONS.	INCIDENTS OF OPERATION. COMPLICATIONS DURING RECOVERY.	SECONDARY OPERATION.	ULTIMATE VISION.
1	Mrs. J. T. Philadelphia.	52	Hard nucleus, soft cortex.		Profuse hæmorrhage into anterior chamber after operation; thick, opaque capsule; slow healing with repeated ciliary neuralgic attacks.		V. = $\frac{20}{40}$
2	Mr. T. McE. Florence, N. J.	50	Hard.	Retina and choroid defective from choroidal inflammation.	Preliminary iridectomy upward; lens removed three months later; soft cortex; thick capsule, choroiditis following operation.		V. = $\frac{20}{50}$
3	Mrs. C. McC. Philadelphia.	70	Hard; thick capsule.		Twelve days after operation, iritic attack.	Double hook operation on capsule 5 months later	V. = $\frac{20}{40}$
4	Mrs. M. Paulsboro', N. J.	76	Hard; thick capsule.		Ether used on account of restlessness; capsule difficult to open with cystitome; iritis with pupillary closure.	Two months later, large downward iridectomy, capsule lacerated by double hook operation.	V. = $\frac{20}{50}$
5	Mr. J. W. S. Camden, N. J.	75	Hard nucleus, with some turbid cortex.				V. = $\frac{20}{50}$
6	Mr. T. G. Philadelphia.	50	Hard nucleus, thick capsule.		Preliminary iridectomy; lens extracted four weeks later; vitreous escape; lens removed without instruments entering eyeball; moderate iritis.	Opaque capsule extracted two months later by a hook.	V. = $\frac{20}{40}$
7	Mrs. M. Philadelphia.	76	Hard.	Feeble patient.	Profuse choroidal hæmorrhage, immediately following iridectomy, emptying eyeball.		V. = 0.
8 / 9	Miss W. Philadelphia.	26	Hard nucleus, soft cortex, binocular cataract.		Double. Preliminary iridectomies at same operation; R. lens extracted one month later; lower half of lens capsule fell into anterior chamber some days after operation; gradually absorbed.		V. = $\frac{20}{50}$
					L. lens extracted six months later; 24 hours after operation, hæmorrhage into anterior chamber; second hæmorrhage in 48 hours.		V. = $\frac{20}{50}$
10	Mrs. C. G. Allentown, Pa.	72	Hard. Two years.	Feeble.			V. = $\frac{20}{50}$
11	Mrs. A. H. S. Phila.	76	Hard. 2 years.	Feeble.	Eyeball lost by suppurative choroiditis.		V. = 0.

12	Mrs. A. M.	28	Hard nucleus, soft cortex.	Feeble.	Preliminary iridectomy; lens extracted six months later.		V.=$\frac{20}{30}$
13	Mrs. A. J. Pottsville, Pa.	66	Hard. One year.		Hæmorrhage into anterior chamber from iris during operation.		V.=$\frac{20}{40}$
14	Mrs. T. M. H. Pittsburg, Pa.	65	Hard. Two years.		Preliminary iridectomy, followed by iritis; lens extracted 5 months later: opaque capsule; moderate iritis; atropia found irritating to conjunctiva.		V.=$\frac{20}{20}$
15	Mr. C. H. Buckstown, Pa.	70	Double; hard; 8 years.		Double operation. R. eye, moderate iridochoroiditis three days afterward.		V.=fingers, 10'.
16					L. eye, spontaneous delivery of lens with capsule; moderate vitreous loss.		V.=$\frac{20}{50}$
17	Mr. W. H. S. Canton, Pa.	70	Hard. 2 years.	Chronic granular conjunctivitis.	Lid spasm necessitated removal of speculum after corneal cut; slow recovery from conjunctival irritability.		V.=$\frac{20}{50}$
18							V.=$\frac{20}{50}$
19	Miss D Philadelphia.	72	Hard. 2 years.	High grade of myopia.	Patient allowed to sit up on 3d day; opaque capsule.	Needle operation on membrane.	V.=$\frac{20}{40}$
20	Miss M. C. Philadelphia.	75	Hard. 3 years.				V.=$\frac{20}{20}$
21	Miss L. F. Jamaica, W. I.	70	Hard. 1 year.		Restlessness of patient caused tearing of iris.		V.=$\frac{20}{30}$
22	Mr. D. S. Philadelphia.	72	Hard. 2 years. Binocular.		R. eye, normal operation.		V.=$\frac{20}{50}$
23					L. eye, operation made 3 years later with a preliminary iridectomy.		V.=$\frac{20}{100}$
24	Mrs. C. P. Germantown, Pa.	76	Hard. 1 year.		Ciliary neuralgia during healing.		V.=$\frac{20}{40}$
25	Mrs. M. W. Philadelphia.	75	Hard. 2 years.	Feeble.	Eyeball lost by suppurative choroiditis.		V.=0.
26	Mr. T. H. M. Philadelphia.	70	Hard. 2 years.		Recovery retarded by capsule separating and falling into anterior chamber, where it was slowly absorbed.		V.=$\frac{20}{40}$
27	Mr. Wm. S. R. Neuchamoni, Pa.	66	Hard. 1 year.				V.=$\frac{20}{30}$
28	Mr. H. B. Frankford, Pa.	60	Hard. 2 years.		Middle of incision was 1 mm in cornea, iridectomy omitted; slight iris adhesion to wound.		V.=$\frac{20}{30}$
29	Mr. J. P. West Chester, Pa.		Hard nucleus, soft cortex; 1 year; opaque capsule.	Feeble.	Capsule thick, with a clear opening in it; slow healing.		V.=$\frac{20}{40}$

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30	Mr. J. B. Camden, N. J.	63	Hard.		Conjunctiva torn by the forceps; slight iritis.		V. = $\frac{2}{3}$
31	Miss —— Phillipsburg, N. J.	65	Hard.		Ether used on account of restlessness of patient.	Double needle operation on capsule	V. = $\frac{2}{200}$
32	Mr. B. T. Philadelphia.	74	Hard.	Feeble.	Iritis after operation; thick capsule.		V. = $\frac{1}{200}$
33	Mrs. —— Philadelphia.	65	Hard. 2 years.		No iridectomy made.		V. = $\frac{2}{50}$
34	Miss M. J. Philadelphia.		Hard.	Feeble.	Irido-choroiditis following; stimulant diet.		V. = $\frac{1}{10}$
35	Miss T. Philadelphia.	82	Hard. 3 years.	Feeble, former choroiditis.	Patient very restless; anodyne used for sleep after operation; stimulant diet.		V. = $\frac{2}{50}$
36	Mr. E. S. Philadelphia.	50	Hard. 2 years.	Use of alcohol and tobacco in excess.	Normal operation.		V. = $\frac{1}{20}$
37	Mrs. A. T. Philadelphia.	56	Hard nucleus, soft cortex.		Eyeball so depressed in orbit as to make it impossible to use Græfe knife; lance-knife used, and cut widened by scissors; thick capsule, iritis moderate.	Double needle operation.	V. = $\frac{20}{200}$
38	Mrs. C. D. Reading Pa.	64	Hard.		Skin and conjunctiva irritable to bandage; moderate attack of choroiditis; capsule thickened.		V. = $\frac{20}{200}$
39	Mrs. S. H. Philadelphia.	65	Hard; thick capsule.	Feeble.	Some iritis after operation.		V. = $\frac{20}{30}$
40	Mr. W. J. W. Philadelphia.	68	Hard nucleus, fluid cortex.		Lens dislocated upward during operation; reduced by cystitome.		V. = $\frac{20}{40}$
41	W. R. R. Millville, Pa.	70	Hard; opaque capsule.				V. = $\frac{20}{200}$
42 43	Mr. Wm. McD. Grahamville, Pa.	73	R. eye hard. L. eye hard. Several years.	Feeble.	Double operation. L. eye lost by suppurative choroiditis.		R. eye, V. = $\frac{20}{70}$ L. eye, V. = 0.
44 45	Mrs. S. B. Philadelphia.	70	Both hard. Five years.		Double operation.		R. eye, V. = $\frac{20}{40}$ L. eye, V. = $\frac{20}{40}$

46 } 47 }	Miss M. W. Upper Darby, Pa.	65	L. eye hard; one year. R. eye hard; two years.		Slight iritis. Operation two years later; iris excised by knife during corneal incision.		V.=$\frac{2}{7}\frac{0}{0}$ V.=$\frac{2}{1}\frac{0}{0}\frac{0}{0}$
48	Mrs. J. W. Norristown, Pa.	78	Hard. 1 year.		Destroyed by suppurative choroiditis; irritable patient.		V.=0.
49 } 50 }	Mrs. M. S. Philadelphia.	70	Hard; double; two years.		Double operation; normal.		R. eye, V.=$\frac{2}{1}\frac{0}{0}\frac{0}{0}$ L. eye, V.=$\frac{2}{1}\frac{0}{0}\frac{0}{0}$
51	Mrs. M. P. Chambersburgh.	56	Hard.		Iritis following operation.		V.=$\frac{2}{4}\frac{0}{0}$
52	Miss C. M. Philadelphia.	26	Soft. 1 year.	Retinal separation.	Rapid healing.		V.=sight before lens opacity.
53 } 54 }	Mrs. C. D. Philadelphia.	50	Hard. 2 years.		Preliminary iridectomy on both eyes. Lens extraction (double) three weeks later. L. eye destroyed by suppurative choroiditis.		R. eye, V.=$\frac{2}{2}\frac{0}{0}$ L. eye, V.=0.
55 } 56 }	Mr. R. L. Finland.	50	Binocular, hard.		Preliminary iridectomies made at different times. Lenses extracted also at different times; normal operations.		R. eye, V. $\frac{2}{2}\frac{0}{0}$ L. eye, V.=$\frac{2}{1}\frac{0}{0}\frac{0}{0}$
57	Mr. Wm. G. Haddenfield, N. J.	70	Hard. 2 years.		Capsule opaque.		V.=$\frac{2}{1}\frac{0}{0}\frac{0}{0}$
58	Mrs. L. P. Philadelphia.	60	Hard. 2 years.		Opaque capsule.	Double needle operation.	V.=$\frac{2}{7}\frac{0}{0}$
59	Mr. D. B. Summit Hill, Pa.	50	Hard. 1 year.		Preliminary iridectomy; lens extracted one month later; severe irido-choroiditis ten days after operation.		V.=$\frac{2}{7}\frac{0}{0}$
60 } 61 }	Miss J. Northumberland, Pa.	76	Hard. 2 years.		Double iridectomy preliminary; double extraction one month later. Acute irido-choroiditis in R. eye with pupillary occlusion.		R. eye, V = light perception. L. eye, V = $\frac{1}{2}\frac{8}{0}$
62	Mr. J. P. Hill Valley, Pa.	55	Hard. 2 years.		Preliminary iridectomy; extraction 1 month later.		V.=$\frac{2}{7}\frac{0}{0}$
63	Mr. T. C. Philadelphia.	60	Hard. 1 year.	Feeble.	Preliminary iridectomy; profuse iris hæmorrhage; lens extracted one month later.		V.=$\frac{1}{7}\frac{5}{0}$ but six weeks after op'n eyeball dest. by irido-choroid.

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64	Mr. I. H.	64	Hard. 2 years.	Feeble.	Preliminary iridectomy; lens extracted one month later; opaque capsule.		V.=$\frac{20}{100}$
65 66	Mrs. E. E. Philadelphia.		Hard. 2 years. Binocular.		R. eye, preliminary iridectomy; lens extracted one month later L. eye, lens extracted six years later. 2 per ct. cocaine; thick capsule; slight iritis.		R. eye, V.=$\frac{20}{70}$ L. eye, V.=$\frac{20}{60}$
67	Mrs. E. O. Germantown, Pa.	70	Hard. 1 year.		Preliminary iridectomy; lens extracted one month later.		V.=$\frac{20}{70}$
68 69	Mr. D. L. Huntington, Pa.	70	Hard; binocular.		Double preliminary iridectomy; double lens extraction three weeks later; pupillary membrane exists in each eye.		R. eye, V.=$\frac{10}{200}$ L. eye, V.=$\frac{20}{70}$
70	Miss M. B. Manayunk, Pa.	68	Hard. 1 year.		Preliminary iridectomy; lens extraction four months later; large loss of fluid vitreous with profuse choroidal hæmorrhage and suppurative choroiditis.		V.=0.
71	Miss E. S. Bristol, Pa.	70	Hard. 1 year.	Strumous diathesis.			V.=$\frac{20}{70}$
72	Mr. T. F. Rundville, Pa.	74	Hard. 2 years.	Epithelioma of nose.	Preliminary iridectomy; lens extraction one month later; some opaque membrane.		V.=$\frac{20}{100}$
73	Mrs. E. O. Germantown, Pa.	67	Hard. 1 year.		Preliminary iridectomy; lens extraction one month later; iritis.		V.=$\frac{20}{70}$
74	Mrs. C. D. Philadelphia.	71	Hard.		Preliminary iridectomy; lens extraction later on; iritis; capsule opaque.		V.=$\frac{12}{200}$
75	Mrs. C. D. Huntingdon, Pa.	70	Hard.		Severe irido choroiditis; capsule opaque; pupillary occlusion.	Iridectomy.	V.=fingers, 10′.
76	Mr. Wm. C. Butler, Pa.	67	Hard (left); two years.	R. eye lost by previous extraction.	Preliminary iridectomy; extraction two months later. Conjunctiva irritable to bandage and atropia; omitted both after first twenty-four hours.		V.=$\frac{20}{30}$
77 78	Mrs. R. M. Cape May, N. J.	81	Hard; double.	Feeble.	Double extraction at same time; rapid healing.		R. eye, V.=$\frac{20}{70}$ L. eye, V.=$\frac{20}{70}$

79	Mrs. M. M. Pottsville, Pa.	58	Hard.	Previous choroiditis.	Preliminary iridectomy; extraction one month later; one month after operation hæmorrhage into anterior chamber, and a second one two weeks later; opaque capsule.	Needle operation.	V.=$\frac{8}{70}$
80 81	Mr. Wm M. Philadelphia.	92	Hard. 2 years. Binocular.	Glaucoma don. subacute, occ. at time of proposed cataract extraction.	Iridectomy double made for this reason; both lenses extracted three months later; right lens removed with its capsule entire; it presenting at mouth of wound; rapid healing. L. eye, normal operation; rapid healing.		V.=$\frac{20}{40}$ in both eyes.
82	Mr. M. M. Elton, Md.	55	Hard. 2 years. Small nucleus, fluid cortex.		Preliminary iridectomy; extraction one month later; opaque capsule.		V.=$\frac{10}{100}$
83 84	Mr. I. B. Slikersville, Pa.	56	Hard; double.		Double preliminary iridectomy; double extraction two months later. R. eye, normal operation; lost by suppurative choroiditis. L. eye has opaque capsule.		R. eye, V.=0. L. eye, V.=fingers at 1.
85	Mrs. S. W. Holmesburg, Pa.	77	Hard; double.		Double preliminary iridectomy; double lens extraction two months later.	Secondary operation on right capsule.	R. eye, V.=$\frac{20}{40}$ L. eye, V.=$\frac{20}{70}$
86	Mr. W. M. Philadelphia.	63	Hard.		Lens extraction made one year after a preliminary iridectomy.		V.=$\frac{20}{70}$
87 88	Mr. W. W. Greenville, Del.	57	Hard; double.		Double preliminary iridectomies, with double extraction two months later. R. eye injured by finger of patient bursting the corneal wound three days after operation; with subsequent irido-choroiditis.		R. eye, V.=$\frac{10}{100}$ L. eye, V.=$\frac{18}{50}$
89	Mrs. L. S. Philadelphia.	60	Hard.		Preliminary iridectomy one month previous to lens extraction; slow recovery; some ciliary irritation; opaque capsule in lower half of pupil.		V.=$\frac{18}{40}$
90 91	Mr. W. I. McB. Philadelphia.	65	Hard (right); two years.	High myopia.	Preliminary iridectomy two months previous to right lens extraction; lens operation difficult by reason of lens being dislocated upward under ciliary bodies. Left lens removed 5 years later; fluid vitreous escape; cocaine.		V.=$\frac{18}{50}$ V.=$\frac{20}{40}$
92	Mrs. M. S. Philadelphia.	76	Hard. 1 year.		Preliminary iridectomy; lens extraction two months later; iris adhesion to angle of wound.	Removal of iris prolapse.	V.=$\frac{18}{50}$
93	Mrs. C. B. Philadelphia.	45	Hard.		Preliminary iridectomy; lens extraction six weeks later; opaque capsule.	Needle operation.	V.=$\frac{20}{50}$

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94 } 95 }	Mr. R. O. Huntingdon, Pa.	60	Hard; double.		Double operation at same sitting; R. eye, rapid recovery. L. eye, severe irido-choroiditis.		R eye, V. = $\frac{12}{100}$ L. eye, occluded pupil, advised secondary oper.
96	Mr. I. H. L. Millville, Pa.	70	Hard.		Iritis after operation; opaque capsule with large opening.		V. = $\frac{20}{100}$
97	Mrs. P. F. Philadelphia.	60	Hard.	Pupillary adhesions, sequelæ of irido-chor.	Removed lens by a spoon on account of iris adhesions; irido-choroiditis following operation, with pupillary occlusion.	Iridectomy to form new pupil.	V. = fingers, 15′.
98	Mrs. P. Camden, N. J.	65	Hard.		Suppurative choroiditis, with loss of eyeball; great swelling of eyeball, with cerebral symptoms.		V. = 0.
99	Mr. F. R. Wilkesbarre, Pa.	75	Hard.		Rapid recovery.		V. = $\frac{20}{50}$
100 } 101 }	Mr. J. C. Coatesville, Pa.	68	Hard; binocular.		R. eye, capsule opaque; irido-choroiditis after operation, with pupillary occlusion. L. eye, preliminary iridectomy two months after right operation; lens extraction two months later.	Iridectomy for pupil formation.	V. = fingers, 8′. V. = $\frac{20}{100}$
102	Mr. E. D. C. Latimer, Pa.	66	Hard.	Opium user. Feeble.	Preliminary iridectomy; lens removed five months later; slow recovery, due to patient's condition.		V. = $\frac{20}{100}$
103	Mrs. P. K. D. Philadelphia.	50	Hard.	Downward iridectomy made several yrs. previously.	Downward corneal incision; some opaque membrane.		V. = $\frac{20}{200}$
104	Mr. W. O. Philadelphia.	75	Hard.		Iritis following operation.		V. = $\frac{20}{100}$
105	Mrs. C. S. Symmdd, Pa.	79	Hard.		Capsule opaque.		V. = $\frac{20}{200}$
106	Mr. M. B. Danville, Pa.	55	Cataract sequelæ of sympathetic irido-choroiditis.	Pupillary occlusions.	Preliminary iridectomy; lens extracted two months later; wound enlarged by scissors; capsule opaque, with some calcareous spots on it; cloudy vitreous due to former choroiditis; rapid recovery.		V. = light perception, due to cloudy vitreous.

107	Mrs. E. S. Philadelphia.	53	Hard. 2 years.	Sluggish pupil.	Loss of vitreous caused by squeezing of lids; lens delivered by a wire spoon; acute choroiditis.		V.=$\frac{8}{100}$
108	Mr. R. C. Huntingdon, Pa.	42	Hard.		Some opacity in capsule; rapid recovery.		V.=$\frac{18}{200}$
109	Mr. G. K. Lancaster, Pa.	65	Hard.		Rapid recovery.		V.=$\frac{20}{50}$
110	Mr. I. M. Beverly, N. J.	70	Hard.		Difficult to open capsule by reason of its thickness and movability of lens; iritis.		V.=$\frac{18}{50}$
111	Mr. W. K. Tamaqua, Pa.	71	Hard.		Rapid healing.		V.=$\frac{20}{200}$
112	Mrs. R. B. Atlantic City, N. J.	66	Hard.	Calcareous degeneration of capsule. Cataract sequela of choroiditis.	Preliminary iridectomy; lens extraction six months later; some choroidal irritation; opaque capsule.		V.=fingers, 10', due to opaque capsule.
113	Mr. S. B. Philadelphia.	70	Hard. 2 years.		Preliminary iridectomy; lens extraction several months later; intolerant to atropia.		V.=$\frac{20}{70}$
114	Mr. A. D. Philadelphia.	76	Hard.		Normal operation; opaque capsule.		V.=$\frac{20}{30}$
115	Mr. W. B. Freeport, Pa.	66	Hard.		Rapid recovery.		V.=$\frac{20}{70}$
116	Mrs. M. Y. Granville, Pa.	38	Hard nucleus, fluid cortex.		Normal healing.		V.=$\frac{18}{...}$
117	Mrs. R. B. Smith's Landing, N. J.	66	Hard.	Sequela of choroiditis. Retina obtuse.	Lens extraction after a preliminary iridectomy; opaque capsule.	Secondary operation on capsule.	V.=fingers, 1'.
118 / 119	Mr. A. B.	40	Hard; double.	Sequelæ of choroido-retinitis & retinal detachment.	R. eye, normal operation; opaque capsule. L. eye, preliminary iridectomy with lens extraction six months later.		R. eye, V.=$\frac{5}{100}$ L. eye, V.=$\frac{5}{100}$
120	Mr. J. K. Philadelphia.	72	Hard.		Restless patient, frequently removing the bandage.		V.=$\frac{20}{100}$
121	Mr. M. D. Philadelphia.	72	Hard.	Sluggish pupil.	Preliminary iridectomy; lens extraction two months later; fluid vitreous; opaque capsule.		V.=$\frac{20}{70}$
122	Mr. J. K. D. Philadelphia.	65	Hard.		Iritis after operation; opaque capsule.		V.=$\frac{8}{100}$

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123	Mrs. E. R. Philadelphia.	70	Hard.		Rapid healing.		V. $=\frac{20}{50}$
124	Mr. F. H. Yardleyville, Pa.	70	Hard. Several years.		Much bleeding from the iridectomy; no inflammation.		V. $=\frac{20}{100}$
125	Mr. R., Philadelphia.	70	Hard.		Ether used.		V. $=\frac{20}{40}$
126	Mrs. A. P. Tullytown, Pa.	65	Hard; double.	Feeble.	L. eye, excessive iris hæmorrhage after iridectomy prevented lens extraction, which was performed seven months later; opaque capsule.	Needle operation.	V. $=\frac{20}{70}$
127					R. eye, operation at same time as left; iridectomy; opaque capsule; excessive iris hæmorrhage.	Needle operation.	V. $=\frac{20}{70}$
128	Mrs. M. T. G. Philadelphia.	76	Hard.		Severe iritis with pupillary closure; opaque capsule.		V. = light percep.
129	Mr. T. C. Philadelphia.	66	Hard.		Preliminary iridectomy; lens extraction one year later; rapid healing.		V. $=\frac{20}{50}$
130	Mrs. L. P. Philadelphia.	80	Hard. 3 years.	Feeble.	Iritis after operation; opaque capsule.	Needle operation.	V. $=\frac{8}{200}$
131	Mr. S. F. Philadelphia.	68	Hard. 2 years.		Rapid healing; secondary membrane; advised needle operation.		V. $=\frac{20}{120}$
132	Mr. F. J. Philadelphia.	76	Hard; double.		R. eye, rapid healing; opaque capsule.	R. Secondary operation.	V. $=\frac{20}{70}$
133					L. eye, operation made two months previously to that on R. eye; rapid healing.		V. $=\frac{20}{40}$
134	Mrs. B. G. Triverton, Pa.	78	Hard.	Choroidal complication, feeble light-perception.	Iritis after operation; opaque secondary membrane.		V. $=\frac{20}{40}$
135	Mr. E. W. White Hall, Pa.	68	Hard; double.		Double extraction; some iritis in R. eye; secondary membrane in each pupil; advised secondary operation.		R. eye, V. $=\frac{20}{120}$
136							L. eye, V. $=\frac{20}{120}$
137	Mr. P. C. Philadelphia.	60	Hard.	Feeble.	Secondary membrane.		V. $=\frac{20}{100}$
138	Mr. B. McC. Dinsmore, Pa.	50	Hard. 2 years.		Patient very restless; bandage unmoved for three days.		V. $=\frac{20}{70}$

139	Mr. H. P. Mt. Holly, N. J.	68	Hard.		Opaque capsule; rapid healing.		V.=$\frac{20}{200}$
140	Mr. E. W. Greenwood, Del.	32	Hard.	Retinal separation.	Rapid healing.		V.=light perception, due to retinal detachment.
141 / 142	Mr. J. R. Philadelphia.	55	Hard; double.	Moderate mydriasis, sequela of a former oculo-motor paralysis.	Extraction operations done with one month interval between them.	Secondary operation on capsule of right eye.	L. eye, V.=$\frac{20}{70}$ R. eye, V.=$\frac{20}{100}$
143	Mrs. E. S. Philadelphia.	77	Hard.		Iritis after operation.		V.=$\frac{20}{100}$
144	Mrs. L. B. Harrisburg, Pa.	76	Hard.	Feeble.	Rapid healing.		V.=$\frac{20}{50}$
145 / 146	Mr. I. K. Blackwoodtown, N. J.	60	Hard; double.	Feeble.	L. eye, moderate iritis; opaque capsule. R. eye, acute choroiditis, opaque capsule and pupillary occlusion.	Needle operation. Iridectomy operation and removal of capsule by a second operation.	V.=$\frac{20}{30}$ V.=$\frac{20}{100}$
147	Mrs. M. E. G. Mt. Holly, N. J.	78	Hard.		Iritis after operation.		V.=$\frac{20}{60}$
148	Mrs. M. L. Mt. Holly, N. J.	73	Hard.		Rapid healing. 148 and 147 were sisters, operated on at same time, and had adjoining beds in hospital.		V.=$\frac{20}{50}$
149	Mrs. E. F. Norristown, Pa.	75	Hard.		Iritis; opaque capsule requiring secondary operation.		V.=$\frac{4}{70}$
150	Mrs. M. K. Wilmington, Del.	68	Hard.	Central corneal opacity.	Profuse bleeding, at time of iridectomy, from cut iris, necessitated postponement of lens removal; this was accomplished 2 months later; capsule opaque, needing secondary operation.		V.=$\frac{7}{200}$
151	Mr. P. E. Alloways town, N. J.	55	Hard.		Patient restless, squeezing eyeball with lids at time of corneal incision, causing an escape of vitreous with spontaneous delivery of lens; choroiditis following.		V.=$\frac{20}{70}$
152	Mr. I. A. Parkesburg, Pa.	70	Hard.	Feeble.	Rapid healing.		V.=$\frac{10}{30}$
153	Mrs. M. D. Pittsburg, Pa.	55	Hard.		Rapid healing.		V.=$\frac{20}{40}$

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154 } 155 }	Mr. I. R.	75	Hard; double.		R. eye. Patient by lid pressure caused spontaneous removal of lens and large loss of vitreous; rapid healing delayed by blow on eye by patient himself, causing some irritation. L. eye operated on one year later; cocaine used; suppurative choroiditis.		V.=$\frac{20}{70}$ V.=0.
156	Mr. A. D Bridgeton, N. J.	66	Hard.	Internal pterygium.	Rapid healing.		V.=$\frac{5}{60}$
157	Miss B. Philadelphia.	92	Hard. Several years.	Feeble.	Capsule thick and resisting; cystitome pierced it, but not able to tear through; repeated attempts caused rupture of lower edge of zonula Zinnii, and lens was dislocated upward; removed by reducing this luxation by cystitome, and use of double spoon pressure on cornea and sclera; rapid healing; tonic treatment.		V.=$\frac{20}{50}$
158	Mr. J. E. H. Brookville, Pa.	61	Hard. 2 years.		Iritis; some opaque capsule.		V.=$\frac{20}{40}$
159	Mr. C. C. Lancaster, Pa.	60	Hard, choroidal cataract; increase of tension; glaucomatous prodromes.	Feeble.	Preliminary iridectomy; lens removal two months later; opaque capsule.	Needle operation.	V.=fingers, 5', due to cloudy vitreous and old choroiditis.
160	Mr. I. K. Philadelphia.	66	Hard. 2 years.	Patient very restless,	Ether used; slight iritis.		V.=$\frac{20}{40}$
161	Mr. B. H. Rochdale, Pa.	66	Hard. Several years.		Rapid healing.		V.=$\frac{12}{200}$
162	Mr. I. H. P. Dover, Del.	63	Hard.		Eyeball lost by suppurative choroiditis.		V.=0.
163 } 164 }	Mrs. E. I. Scranton, Pa.	55	Hard; double.		R. eye. Iritis following operation. L. eye. Lens extracted some years previously by same method; no notes of this operation.		V.=$\frac{20}{50}$ V.=$\frac{20}{40}$
165	Mr. G. T Philadelphia.	65	Hard.		Preliminary iridectomy made two years previously by Dr. Goodeman; lens extraction showed opaque capsule, requiring later a secondary operation.		V.=$\frac{15}{200}$

166	Dr. F. A. F. Bethlehem, Pa.	78	Hard. Several years.		Rapid healing.		V.=$\frac{20}{20}$
167	Mrs. S. H. Rochdale, Pa.	74	Hard.		Excessive bleeding from iridectomy caused postponement of lens removal to a period 3 months later; opaque capsule.	Needle operation.	V.=$\frac{20}{200}$
168	Mrs. M. E. Philadelphia.	45	Hard.		Iritis after operation.		V.=$\frac{18}{40}$
169	Mr. I. S. Port Leyden, N. Y.	78	Hard. 1 year.		Opaque capsule.	Needle operation.	V.=$\frac{20}{60}$
170	Mr. W. H. Philadelphia.	62	Hard.		Rapid healing; secondary membrane.	Needle operation; cocaine.	V.=$\frac{20}{50}$
171 172	Mrs. M. W. Philadelphia.	56	Hard; double.	Feeble.	Double operation; opaque capsule in left eye, requiring secondary operation.		R. V.=$\frac{20}{40}$ L. V.= fingers at 3″.
173	Mr. R. L. Towanda, Pa.	63	Hard.		Rapid healing; opaque capsule.	Extraction of capsule.	V.=$\frac{18}{200}$
174 175	Mr. M. A. Hampton, Va.	58	Hard; double.		R. eye. Cocaine used. L. eye. Operation six months later; cocaine used; opaque capsule.		V.=$\frac{20}{40}$ V.=$\frac{20}{200}$
176	Mr. T. N. S. Woodland, Pa.	52	Hard.		Cocaine; rapid healing.		V.=$\frac{20}{20}$
177	Mr. S. H. New Berlin, Pa.	70	Hard.		Cocaine.		V.=$\frac{20}{30}$
178	Mr. J. S. Beau, Pa.	60	Hard.		Cocaine; rapid healing; capsule partially opaque.		V.=$\frac{20}{60}$
179	Mrs. C. T. North Haven, Ct.	75	Hard.		Cocaine.		V.=$\frac{15}{70}$
180	Mrs. A. T. Philadelphia.	68	Hard.		Cocaine; iritis; opaque capsule.	Needle operation.	V.=$\frac{20}{50}$
181	Mrs. H. McK. Glen Riddle, Pa.	52	Hard.		Suppurative choroiditis.		V.=0.
182	Mr. J. S. Beau, Pa.	54	Hard.		Rapid healing; cocaine.		V.=$\frac{20}{40}$
183	Mr. M. B. Morris Run, Pa.	54	Hard.		Cocaine; Hæmorrhage into anterior chamber on fifth day with rapid absorption.		V.=$\frac{15}{50}$
184	Mr. J. M. Philadelphia.	70	Hard.		Cocaine; slight vitreous loss.		V.=$\frac{20}{20}$

No.	NAME.	AGE.	QUALITY AND DURATION OF CATARACT.	COMPLICATIONS.	INCIDENTS OF OPERATION. COMPLICATIONS DURING RECOVERY.	SECONDARY OPERATION.	ULTIMATE VISION.
185 } 186 }	Mr. A. D. H. Blossburg Pa.	59	Hard; double.		Left eye, cocaine; rapid healing; opaque capsule. R eye, operation six months later; cocaine. Some capsular opacity.	Needle operation.	V.=$\frac{18}{50}$ V.=$\frac{18}{50}$
187	Mr. G. T. Philadelphia.	66	Hard.		Cocaine; rapid healing.		V.=$\frac{20}{100}$
188	Mr. I. B. Oil City, Pa.	55	Hard.	Extreme restlessness of patient.	Cocaine; opaque capsule, also iritis.		V.=$\frac{18}{70}$
189 } 190 }	Mr. F. G. M. Bethlehem, Pa.	52	Hard; double.		L. eye, cocaine; opaque capsule; advised secondary operation. R eye, operation six months later; opaque capsule; hæmorrhage into anterior chamber four days after operation; secondary operation advised.		V.=$\frac{20}{100}$ V.=$\frac{5}{200}$
191	Mr. B. Hellertown, Pa.	55	Hard.	Restlessness of patient.	Iritis after operation; partly opaque capsule.		V.=$\frac{18}{50}$
192	Mr. S. W. Philadelphia.	71	Hard.		Iridectomy accompanied with loss of vitreous; postponed lens removal to several months later on; cocaine used for lens removal; irido-choroiditis after operation.		V.=$\frac{6}{120}$
193	Mr. I. S. Millville, N. J	55	Hard.		Cocaine; opaque capsule.	Extraction of capsule through corneal opening.	V.=$\frac{20}{100}$
194	Mr. S. G. Langhorne, Pa.	61	Hard.	Feeble.	Cocaine; rapid healing; opaque capsule.		V.=$\frac{20}{200}$
195	Mr. W. McB. Philadelphia.	70	Hard.	Myopic eye.	Cocaine; vitreous loss; rapid healing.		V.=$\frac{20}{40}$
196	Mr. I. M. Philadelphia.	75	Hard.		Cocaine; opaque capsule; iritis; secondary operation needed.		V.=fingers, 4'.
197	Mrs. M. L. Philadelphia.	72	Hard.		Rapid healing; opaque capsule.	Removal of capsule through corneal opening.	V.=$\frac{20}{100}$
198	Mr. I. R. S. Philadelphia.	75	Hard.		Cocaine; slight iritis.		V.=$\frac{20}{50}$

199	Mr. W. H. W. Philadelphia.	62	Hard.		Cocaine; opaque capsule; moderate iritis.		V.=$\frac{20}{40}$
200	Mr. E. O.	34	Cataract sequela of irido-choroiditis.	Sympathetic.	Cocaine; opaque capsule; rapid healing.	Removal of capsule through corneal opening.	V.=fingers, 1'. cloudy vitreous.
201	Mrs. M. L. Philadelphia.	72	Hard.	Feeble.	Cocaine; opaque capsule; slow healing.	Extraction of capsule thro' corneal opening.	V.=$\frac{8}{200}$
202 203	Mrs. A. A. Philadelphia.	63	Hard; double.		R. eye, cocaine; rapid healing. L. eye operation six months later on; cocaine; capsulitis.		V.=$\frac{20}{30}$ V.=$\frac{20}{50}$
204	Mrs. M. C. Philadelphia.	66	Hard.		Cocaine; acute conjunctival iritation after operation; opaque capsule.		V.=$\frac{20}{200}$
205	Mrs. S. E. H. Camden, N. J.	62	Hard.		Cocaine; iritis; hæmorrhage into anterior chamber four days after operation; opaque capsule.	Needle operation.	V.=$\frac{20}{40}$
206	Mrs. A. McC. Philadelphia.	76	Hard. 3 years.		Cocaine; iritis; partly opaque capsule.		V.=$\frac{20}{40}$
207	Mr. J. B. Mt. Holly, N. J.	80	Hard. 2 years.		Cocaine; thick capsule; iritis.		V.=$\frac{18}{40}$
208	Mrs. I. W. Philadelphia.	76	Hard. 3 years.	Feeble.	Cocaine; rapid healing; opaque capsule.		V.=$\frac{20}{100}$
209	Mrs. M. McN. Philadelphia.	70	Hard; over-mature.		Escape of fluid vitreous; cocaine; opaque capsule.	Needle operation.	V.=$\frac{18}{100}$
210	Mrs. M. B. Conshohocken, Pa	75	Hard. Several years.	Feeble.	Cocaine; cornea very cloudy 24 hours after operation, from irido-keratitis, due to debility; cleared up by stimulant treatment.		V.=$\frac{20}{40}$
211	Mr. M. L. Philadelphia.	59	Hard; partially absorbed.		Lens removed by sharp hook; fluid vitreous; cocaine.		V.=$\frac{20}{100}$
212	Mr. C. V. Philadelphia.	70	Hard. 2 years.		Cocaine. Suppurative choroiditis.		V.=light percep.
213	Mrs. A. T. Philadelphia.	65	Hard. 5 years.		Cocaine; fluid vitreous; lens removed by wire loop; iritis; opaque capsule, advised secondary operation.		V.=$\frac{15}{200}$
214	Mr. I. B. Mahony Place, Pa.	45	Traumatic cataract.	Lens dislocated upward; fluid vitreous.	Cocaine; vitreous loss; lens removed by hook.		V.=$\frac{20}{40}$

No.	NAME.	AGE.	QUALITY AND DURATION OF CATARACT.	COMPLICATIONS.	INCIDENTS OF OPERATION. COMPLICATIONS DURING RECOVERY.	SECONDARY OPERATION.	ULTIMATE VISION.
215	Mr. D. C. W. Parkesburg, Pa.	76	Hard. 2 years.		Cocaine; opaque capsule; secondary operation needed.		V.=fingers, 3'.
216	Mr. H. T. Darby, Pa.	74	Hard.		Cocaine; iritis; secondary membrane.		V.=$\frac{20}{200}$
217	Mrs. A. T. Philadelphia.	65	Hard.		Cocaine; moderate iritis; opaque membrane with pupillary occlusion.	Iridectomy with removal of membrane.	V.=$\frac{9}{200}$
218	Mr. B. McC. Philadelphia.	48	Hard.		Cocaine; irido-choroiditis moderate.		V.=$\frac{20}{70}$
219	Mrs. K. O'B. Philadelphia.	36	Hard.	Dislocation of lens.	Cocaine; iritis.		V.=$\frac{6}{36}$
220	Mr. A. K. Pittsburg, Pa.	69	Hard. 4 years.		Cocaine; fluid vitreous escape; choroiditis.		V.=$\frac{20}{50}$
221	Mrs. P. Philadelphia.	90	Hard. 3 years.		Cocaine; partly opaque capsule.		V.=$\frac{6}{20}$

The use of cocaine as an anæsthetic. Method of application: drop one drop of a 2 p.c. solution of hydroclorate of cocaine in the eye; wait one minute, then apply a second drop to eye. This drug has been used in forty-eight cases, with great relief of pain to the patient. The first case in which it was used suffered a few hours later on from a violent purulent inflammation, totally destroying the eyeball. This case occurred at Wills Hospital, and was quickly followed by two similar cases in the same hospital, which led to the belief at that time that the cocaine was acting as the exciting cause. Further experience has not confirmed this view, and therefore its use is continued.

Ether as an anæsthetic was used in four cases, because of the impossibility of controlling the patient without its use. I am decidedly of the opinion that the depressing sequelæ of ether are detrimental to these cases.

Summary of results:

Successes	= 85.2 per cent.	
Partial successes	= 8.1	"
Failures	= 6.7	"
	100.	

In 8	cases vision	= $\frac{20}{200}$
14	" "	= $\frac{20}{200}$
41	" "	= $\frac{20}{100}$
20	" "	= $\frac{20}{50}$
3	" "	= $\frac{20}{40}$
24	" "	= $\frac{20}{30}$
4	" "	= $\frac{18}{30}$
1	" "	= $\frac{15}{30}$
1	" "	= $\frac{15}{60}$
3	" "	= $\frac{15}{70}$
5	" "	= $\frac{10}{70}$
26	" "	= $\frac{20}{100}$
14	" "	= $\frac{20}{200}$
12	" "	= $\frac{17}{200}$
7	" "	= $\frac{12}{200}$
5	" "	= $\frac{8}{200}$
18	" "	= counts fingers from 3 to 5 feet.
3	" "	= light perception.
12	" "	= 0
221		

Eleven of these were lost by suppurative irido-choroiditis, and one by choroidal hæmorrhage after the operation.

CATARACT EXTRACTION WITHOUT IRIDECTOMY.

BY H. KNAPP, M.D.,
NEW YORK.

AMONG the new operative procedures with which I became acquainted in Europe last winter, I considered two as particularly worthy of being adopted, viz., the extraction of cataract without iridectomy, and the advancement of Tenon's capsule in cases of squint. During the last ten years repeated attempts have been made, especially in Paris, to abandon the exsection of a piece of iris in cataract extraction, a custom which had become general through the authority of the late von Graefe. Until two years ago, these attempts had been unsuccessful, but now the difficulties and accidents inherent in the so-called simple extraction seem so far overcome as to let it appear probable that this method will in future be extensively used. It is principally advocated and practised by Galezowski, De Wecker, and Panas. When I returned to New York in May of this year, I had made up my mind to perform Graefe's extraction only for a short time, and gradually to go over to the uncombined extraction. I made eight Graefe's extractions. They passed so smoothly, the healing was so kind, and the results were so good that it cost me an effort to remain true to my purpose.

On June 10th I began with the simple method. The first patient was a man of seventy-five years, who had a hard, uncomplicated cataract. His eye was cocainized, the upper third of the cornea divided with a Graefe knife and the capsule lacerated freely in the centre. When I endeavored to expel the lens, I found that the iris offered great resistance. I employed more and more pressure, until a bead of vitreous protruded. Then I exsected a piece of iris, divided the capsule at the periphery, and expelled the lens easily and without any

more vitreous. The application of the lips of the wound was perfect, the recovery and visual result were good.

I saw at once that the section of one third of the transparent margin of the cornea, sufficient for the exit of cataracts when iridectomy is made, is insufficient for extractions without iridectomy.

Immediately after the operation just related, I performed *another extraction* of cataract. This time I succeeded in expelling the lens without iridectomy. The patient was a man, M. D., aged seventy-six, of New York, from whose other eye I had removed a cataract according to Graefe's method, quite successfully, a year before. I made the section larger, lacerated the capsule, and expelled the lens by pressure with the spoon. Some pigment was detached from the protruding iris. The iris receded spontaneously, and when I saw that the pupil was round and central, I injected, with a lachrymal syringe made for the purpose, a few drops of Panas' solution of biniodide of mercury in alcohol and water (1 : 400 : 20,000). Eserine was instilled into the conjunctival sac. No pain; pupil narrow, central and round on 3d day. Eserine for three days more; then pupil found adherent all around. Atropine instilled; pupil partially freed. Discharged on 23d day; vision $\frac{10}{200}$; pupillary opacities; eye, however, in excellent condition and sight will be good either spontaneously or by simple needling.

The *second case* was a soft cataract in a man thirty-six years of age. A timid division had been made before, but no lens matter had passed into the anterior chamber. The extraction was done in the same way as in the previous case; the section was smaller. The iris receded spontaneously, the pupil was round, central and clear. Healing undisturbed. V. $= \frac{15}{200}$ on account of optic nerve atrophy; the other, non-cataractous eye has V. $= \frac{20}{200}$.

The *third* case, a woman of fifty-five, hard cataract, extraction and healing undisturbed. V. $= \frac{20}{100}$.

The *fourth* case, a woman of sixty, hard cataract, operated without accident, showed posterior synechiae on fourth day; the eserine instillations replaced by atropia. Discharged on

15th day, pupil somewhat cloudy, some posterior adhesions; V. = $\frac{10}{200}$, promising to become good.

The *fifth* case, a woman aged sixty-three, of Brooklyn, was operated on without accident, yet I did not succeed in completely clearing the pupil. She had iritis from the 4th day. Eserine replaced by atropia and leeches to the temple. Two thirds of the pupillary edge became disengaged. The pupil was moderately clouded (no pseudo-membrane) when patient was discharged on 25th day, with some circumcorneal redness and V. = $\frac{20}{200}$.

The *sixth* case, a woman of fifty-two, with a hard, not completely ripe cataract, was operated on, July 9th. Section large, conjunctival flap along the whole section; lens came out readily, remnants of cortex pressed out with the lower lid. The iris did not recede, but had to be reduced with a style, which performance succeeded perfectly. No pain. Filtration chemosis in lower part on 3d day. Atropia. Pupil dilated, central, no adhesions.

Reviewing these six operations, we find three ideal recoveries with round and movable, perfectly free pupils, and three cases with posterior synechiae, in none extensive or membranous, so that all cases may be termed successful.

In the *mode of operating* I followed Panas principally. The outside of the lids was first washed with soap, then with the biniodide solution. The conjunctival sac was sterilized, by instilling biniodide or bichloride solutions with an ordinary atropine dropper. Before this, the everted upper lid and its edge had been carefully wiped with absorbent cotton, saturated with the antiseptic solution. I borrowed this procedure from Hirschberg. The section was made quickly, so that no iris fell before the blade of the narrow knife. The expulsion of the lens was easier when I pressed with a curette on the lower part of the cornea and with the edge of a spoon simultaneously on the posterior lip of the wound. The iris is a decided obstacle to the ready exit of the lens, and even much more so to that of the cortical remnants. I saw Panas very painstaking in cleansing the pupillary field, expelling the remnants over the prolapsed iris, fishing them out with a Daviel's spoon introduced

four and five times into the anterior chamber, and the like; yet he injected only very small quantities of his antiseptic into the anterior chamber, apparently less for the purpose of clearing the pupil than of sterilizing the wound.

To obtain a central, round pupil does not seem to be difficult. In most cases the iris recedes spontaneously, or can easily be reduced with a style. When once in its proper position, it shows no tendency to prolapse again. I have injected Panas' solution of biniodide of mercury with E. Meyer's delicate lachrymal syringe, carefully disinfected beforehand and used for no other purpose. An instrument like that used by De Wecker, or, if we want to be unimpeachable, like Koch's syringe, can as well be used, but finding this syringe very handy, I have not sought for anything else. There was no trace of incarceration of iris in any of these six cases. Prof. Panas told me, that since November, 1885, incarceration had not occurred any more in his practice.

What is the cause of the non-occurrence, or at least, great rarity of prolapse of iris at present, whereas formerly it was the bane of all operative procedures without iridectomy. The change, to my mind, is due to the introduction of cocaine. In a cocainized eye there is very little tendency to prolapse of the iris, and when after forcible protrusion the iris has been artificially reduced, it stays in the eye. Without cocaine the re-instatement of Daviel's operation would not have been possible. The working at the eye for cleansing the pupil, the reduction of the iris with instruments, the washing out of the anterior chamber when the operation is completed, all this could not be done if the eye had not been rendered insensible and more or less reduced in tension by the cocaine.

To judge competently of the value of the revived simple extraction, we as yet lack extensive and careful statistics, in fact none have as yet been published, apart from a mention of so and so many operations and the assertion that the operators were highly satisfied with the results. I, for one, would not lay the greatest stress on a round pupil. It remains to be seen how the visual acuteness, and the number of necessary after-operations will compare with the combined

extraction. One advantage, pointed out by several operators, outweighs, in my opinion, all others, that is the *perfect freedom of the section from portions of lens, capsule and iris*, provided that the latter be obtainable, as it seems it is. The complete reduction of the iris, either spontaneous or instrumental, and the injection of a liquid into the anterior chamber, along the whole section, insure cleanliness of the wound and consequently primary union more than seems possible by any other method.

REPORT OF FIFTY CASES OF CATARACT EXTRACTION, WITH REMARKS.

By DAVID WEBSTER, M.D.,
NEW YORK.

At the meeting of this Society, held at the Kaaterskill House, in July, 1883, I reported my first thirty-five cases of cataract extraction. I now avail myself of the privilege of presenting the statistics of my next fifty consecutive cases. These fifty extractions were done upon the eyes of forty-three different patients, seven of them having had both eyes operated upon. Five of the seven had the second eye operated upon a longer or shorter time after having recovered from the operation on the first. The other two had the cataract extracted from both eyes at the same sitting. All four of the eyes in these two cases made smooth recoveries, and in one of the cases the resulting vision was $\frac{20}{20}$ when both eyes were used at once, $\frac{20}{40}$ each when tested separately. I wish to place myself on record, in this connection, that, heretical as it may seem, *I approve of double cataract extractions in judiciously selected cases.* I have seen the operation performed upon both eyes at the same sitting four times in all, and every eye in all these four cases healed kindly and recovered good sight. Of course the opportunity to operate upon both eyes at once occurs comparatively infrequently. In the vast majority of

cases when the patient presents himself to the ophthalmic surgeon the cataract is mature in only one eye, and no one would think of operating upon the second eye while the cataract remained in an immature condition. This is almost invariably the case when the patient resides in or near any of the larger cities. Cataract seldom ripens in both eyes with equal rapidity, and as soon as one eye is practically blind the patient applies for relief, and I think ophthalmic surgeons are now generally in favor of operating upon the eye in which the cataract is mature while there is still sufficient vision remaining in the fellow eye to enable the patient to get about. But very frequently, I may almost say, *as a rule*, persons of moderate means, or of no means at all, residing at a distance from ophthalmic surgeons, on occount of the trouble and expense defer consulting the eye surgeon as long as they retain any useful vision, and sometimes much longer.

In the class of cases just referred to, if both cataracts are not extracted at the same sitting the chances are that the second one will never be extracted. Every day such a patient remains away from his home and family seems to him an age; every dollar he spends for board and for doctor's fees seems to him a small fortune. If he gets through the operation safely, and recovers the sight of one eye, he thinks that will do well enough for him. He will not return and spend the rest of the hard-earned savings of a life-time in order to recover the sight of his other eye. It is better to operate upon both eyes at once in such cases for several reasons:

1. It is obviously better that the patient should have the sight of both eyes than of only one for the rest of his life.

2. It enlarges his visual field, so that the danger of his being run over, or of his running against things, is diminished.

3. A cataractous lens, allowed to remain in the eye until it becomes hypermature, is liable to assume the characteristics of a foreign body. It may undergo calcific degeneration. It may easily become dislocated spontaneously. In either case, it not only endangers the eye in which it is, but may even, by sympathetic inflammation, destroy the sight of the eye which has been successfully operated upon.

4. My own experience and observation do not lead me to suppose that the risks to the patient are very much increased by operating upon both eyes at the same sitting.

The method of operating in these fifty cases has been the same as that in my first reported thirty-five cases, viz.: A modified Graefe's cut in all the cases. A preliminary iridectomy was done in five cases, and in one of them Foerster's massage of the lens was attempted. Having had the misfortune of seeing one or two eyes that had been lost apparently in consequence of Foerster's massage, and having read and heard of several others, I confess I stroked the cornea over the region of the coloboma very gently, and I do not think the operation was very effectual in hastening the ripening of the lens. All the cases in which preliminary iridectomy was done, including the Foerster's, did well, however, the resulting vision in every case being more than $\frac{20}{200}$.

The lens was extracted in its capsule in four cases, in two cases intentionally, in the other two in response to the emergencies of the operation.

In one case the cataract had existed for fifteen years, and the lens had become shrunken and had undergone calcific degeneration. In this case I did an iridectomy, and then removed the lens with a wire spoon, without the loss of a drop of vitreous. Although this eye healed kindly, and with a clear pupil, the resulting vision was only $\frac{10}{200}$, and I have to reckon it with the partial successes; the real cause, no doubt, being due to the damaged condition of the eye from having so long contained a calcific lens, or to an abnormal condition of the eye, which had *caused* the lens to become calcified. In another case a previous operation for the removal of the cataract had been attempted by a doctor in a neighboring city, but, for some reason unknown to the patient or to myself, he had abandoned the attempt, leaving the cataract *in situ*. The only result was so wide a dilation of the pupil that only the smallest or narrowest rim of iris remained visible. In this case I found it very easy to extract the lens in its capsule without iridectomy. In a third case, the vitreous followed my knife on completing the incision, and I had no time to do

an iridectomy or lacerate the capsule, but at once proceeded to deliver the lens by pressure, with very little loss of vitreous. In the fourth case the lens presented at the wound on completing the iridectomy, and the indications seemed to be to extract it without lacerating the capsule, which I easily accomplished.

There were few cases in which so-called accidents occurred during the operation, other than those I have already described. In one case, the patient being apparently well under ether, as soon as I seized his iris with the iris-forceps he suddenly partially closed his eyelids, and, at the same time, rolled his eyeball upward, so that before I could let go the iris was torn and the anterior chamber filled with blood. In another case, after the extraction had been completed, and the speculum removed, upon my raising the upper lid with my finger, to see that the wound was clean and its lips well coaptated, a sudden spasmodic closure of the lids *turned over the corneal flap,* and produced a gush of vitreous. The eye was lost as the consequence.

As to the complications during recovery: In three cases there was *prolapse of the iris,* occurring on the fifth, ninth, and tenth days respectively. *Plastic iritis* occurred in six cases, resulting in closure of the pupil in three of them. Two eyes were lost by *suppuration,* commencing at the wound and extending to the iris and the vitreous. A third was lost by *glaucoma,* commencing after the eye had recovered from the operation with vision $\frac{20}{200}$.

One patient, a female, had a very severe attack of jaundice, coming on a day or two after the operation, but this did not interfere with the good recovery of the eye.

No.	Age.	Sex.	General Health.	Quality and Duration.	Method of Operating; Anæsthetic; Remarks; After-Treatment, Etc.	Time in Hospital.	Date of Record of Vision.
1	62	M	Good.	Senile, 2 years.	Graefe up; iris torn by sudden, spasmodic closure of lids while iris was in grasp of forceps; considerable hæmorrhage; ether; no vomiting; some pain first three days.	18 days.	6 months. V=$\frac{20}{70}$
2	55	F	Poor.	Senile, 1 year.	Graefe up; ether; no accident; thin cornea; recovery smooth.	26 days.	26 days. V=$\frac{20}{70}$
3	70	F	Fair.	Senile.	Ether; Graefe up; no accident; thin cornea; recovery smooth.	24 days.	24 days. V=$\frac{20}{200}$
4	76	M	Poor.	Senile.	No anæsthetic; Graefe up; healed with membrane in pupil; keratonyxis on 28th day.	23 days.	5 weeks. V=$\frac{20}{100}$
5	62	M	Good.	Senile.	Ether; Graefe up; slight hæmorrhage into ant. cham. from cut iris; keratonyxis 4 mo. and again 8 mo. after operation.	20 days.	1 year. V=$\frac{20}{40}$
6	52	M	Chronic Bronchitis.	Senile.	Graefe up; recovery smooth; no anæsthetic; keratonyxis 14 days and also 30 days after extraction.	18 days.	18 days. V=$\frac{20}{200}$
7	65	F	Poor.	Senile, 5 years.	Ether; Graefe up; no accident; recovery smooth.	28 days.	28 days. V=$\frac{20}{50}$
8	64	F	Good.	Senile, 1 year.	Ether; Graefe up; considerable soft lens matter remained; on fifth day slight prolapse of iris in angle of wound.	33 days.	33 days. V=$\frac{20}{50}$
9	58	M	Good.	Senile, 1 year.	Ether borne badly; coughed frequently; Graefe up; no accident.	21 days.	3 months. V=$\frac{20}{40}$
10	63	M	Good.	Senile, 1½ years.	No anæsthetic; Graefe up; some bleeding into anterior chamber.	21 days.	1 months. V=$\frac{20}{70}$
11	67	M	Fair.	Senile, 8 years.	Ether; Graefe up; considerable bleeding into anterior chamber; chemosis on 6th day, controlled by iced cloths and atropine; keratonyxis on 32d day.	36 days.	43 days. V=$\frac{20}{100}$
12	73	F	Good.	Senile, 1 year.	Ether; Graefe up; anterior chamber filled with blood; keratonyxis on 11th day.	27 days.	27 days. V=$\frac{20}{200}$
13	54	M	Poor.	Senile.	No anæsthetic; upward cut, and vitreous followed the knife; lens in its capsule delivered by pressure without iridectomy; prolapse of iris on 16th day; pressure bandage.	14 days.	5 weeks. V=$\frac{20}{200}$
14	63	M	Poor.	Senile, 3 years.	No anæsthetic; Graefe up; no accident; recovery smooth.	21 days.	21 days. V=$\frac{20}{200}$
15	68	F	Good.	Senile, 2 years.	Ether; Graefe up; some cortex left; severe attack of jaundice during recovery; 11 weeks after extraction failed to cut the pupillary membrane with Knapp's knife-needle; 3 days later removed it by Agnew's hook operation.	23 days.	5 months. V=$\frac{20}{70}$
16	76	M	Good.	Senile, 10 years.	Ether taken badly; Graefe up; on 9th day prolapse of iris; iced cloths and atropine.	21 days.	13 months. V=$\frac{20}{40}$

17	49	M	Good.	Senile, 9 years.	No anæsthetic; Graefe up; fourth day suppuration of wound; suppurative iritis; slight atrophy of globe; enucleated 11 months later.	30 days.	V=0.	
18	60	M	Good.	Senile, 1 year.	Ether; upward cut; after iridectomy lens presented in its capsule, and was extracted without loss of vitreous.	19 days.	35 days.	V=$\frac{20}{200}$
19	49	M	Good.	Nuclear, 9 years.	Cocaine; preliminary iridectomy and Foerster's operation six weeks previous; Graefe up; keratonyxis 7 weeks later, and repeated in 3 days. (Other eye of Case 17.)	29 days.	1 year.	V=$\frac{20}{50}$
20	77	F	Good, but crippled with rheumatism.	Senile, 3 years.	Cocaine; Graefe up; recovery smooth.	36 days.	1 year.	V=$\frac{20}{70}$
21	67	F	Good.	Senile, 10 years.	Ether; preliminary iridectomy 6 weeks previous; upward cut; iritis with adhesions; keratonyxis; granular lids.	3½ months.	3¼ mos.	V=$\frac{20}{200}$
22	38	M	Good.	Traumatic, 1 year.	Cocaine; Graefe up; keratonyxis 8 weeks and again 10 weeks after.	27 days.	11 months.	V=$\frac{20}{15}$
23	77	F	Bent almost double with rheumatism.	Senile, 3 years.	Cocaine; Graefe up; suppurative iritis; closure of pupil; iridectomy 6 months later. (Other eye of Case 20.	37 days.	6 months.	V=fingers at 3'.
24	69	M	Good.	Senile, 5 years.	Cocaine; upward cut; lens removed in capsule without iridectomy.	21 days.	20 days.	V=$\frac{20}{70}$
25	69	M	Good.	Senile, 5 years.	Cocaine; Graefe up. (Other eye of Case 24, and both done at same sitting.)	27 days.	20 days.	V=$\frac{20}{70}$
26	41	F	Fair.	Senile, 6 years.	Cocaine; Graefe up tried to extract in capsule without iridectomy, but failed).	19 days.	19 days.	V=$\frac{20}{70}$
27	55	F	Good.	Senile, 5 years.	Cocaine; Graefe up; after extraction was completed, raised upper lid to see whether wound was all right, when, by a sudden, spasmodic closure of lids, patient everted the corneal flap and extruded considerable vitreous; eye lost by suppuration.	27 days.	27 days.	V=perception of light.
28	57	F	Good.	Senile, 7 years.	Cocaine; Graefe up; keratonyxis 30 days later.	21 days.	2 months.	V=$\frac{20}{50}$
29	77	M	Good	Senile, 2½ years.	Cocaine; Graefe up; on escape of lens some vitreous followed. (Other eye of Case 16.)	20 days.	2 months.	V=$\frac{20}{50}$
30	56	F	Good.	Senile, 6 years	Cocaine; Graefe up; considerable cortex left; keratonyxis 3 months later.	31 days.	4 months.	V=$\frac{20}{50}$
31	69	F	Good.	Senile, 2 years	Cocaine; Graefe up; cortical matter left in the pupil; keratonyxis 6 weeks later.	21 days.	8 months.	V=$\frac{20}{20}$
32	48	M	Good.	Senile, 2 years.	Cocaine; Graefe up; iritis; opacity of cornea; iridectomy 3 months later.	40 days.	3 mos.	V=$\frac{20}{200}$
33	53	F	Good.	Senile, 1 year.	Cocaine; Graefe up; iritis with closure of pupil; iridectomy 6 weeks later, followed in 2 weeks by keratonyxis.	28 days.	6 mos.	V=$\frac{20}{200}$

No.	Age.	Sex.	General Health.	Quality and Duration.	Method of Operating; Anæsthetic; Remarks; After-Treatment, Etc.	Time in Hospital.	Date of Record of Vision.
34	39	F	Fair.	Senile, 5 years.	Cocaine; Graefe up; keratonyxis; vision equals twenty two-hundredths; glaucoma afterwards set in, and several operations were done, leaving only perception of light.	28 days.	V=percep. of light.
35	59	M	Good.	Senile, 2 years.	Cocaine; Graefe up; keratonyxis on 18th day. (Other eye of Case 9.)	25 days.	6 weeks. V=$\frac{20}{40}$
36	75	F	Rather feeble.	Senile, 2 years.	Cocaine; Graefe up; recovery smooth.	21 days.	21 days. V=$\frac{20}{100}$
37	75	F	Rather feeble.	Senile, 1 year.	Cocaine; Graefe up; recovery smooth. (Other eye of Case 36, and done at same sitting.)	21 days.	21 days. V=$\frac{20}{100}$
38	38	M	Good.	Rather soft, 7 years.	Cocaine; preliminary iridectomy done 20 months previously; upward cut; keratonyxis on 11th day.	19 days.	19 days. V=$\frac{20}{25}$
39	63	F	Has kidney disease, and is an opium eater.	Hard, several years.	Cocaine; Graefe up; iritis; was in hospital 6 years before with *diabetes* and choroido-retinitis.	21 days.	6 mos. V=counts fingers.
40	66	F	Good.	Senile, 2 years.	Cocaine; Graefe up; prelim. iridect. by Dr. C. R. Agnew 6 wks. bef. on acc. of old iritis with adhes'ns; recov. smooth.	21 days	3 mos. V=$\frac{20}{200}$
41	58	F	Good.	Senile, 9 years.	Cocaine; Graefe up; recovery smooth.	21 days.	21 days. V=$\frac{20}{30}$
42	64	F	Good.	Senile, 1 year.	Cocaine; Graefe up; pupil found full of soft lens matter on removal of bandage.	21 days.	V=counts fingers.
43	75	M	Good.	Lens had shrunken and undergone calcific degen'n. 15 years.	Cocaine; upward cut and iridectomy; lens removed in its capsule by wire spoon, without loss of vitreous; recovery smooth.	21 days.	21 days. =$\frac{10}{200}$
44	52	F	Good.	Senile, 1 year.	Ether; Graefe up; vomiting; soft lens matter left; keratonyxis on 24th day.	28 days.	V=counts fingers.
45	68	F	Fair.	Lens semi-transparent; some reflex from fundus. Many yrs.	Ether; Graefe up; some lens matter left in pupil; keratonyxis 23 days after.	4 weeks.	4 mos. V=$\frac{20}{200}$
46	74	F	Fair.	Senile, several years	Ether; Graefe up; no accident.	2 mos.	9 weeks. V=$\frac{20}{50}$
47	75	M	Feeble.	Senile, 3 months.	Ether; Graefe up; no accident.	2 weeks.	2 months. V=$\frac{20}{40}$
48	65	F	Rheumatic.	Senile, 3 years.	Cocaine; preliminary iridectomy done under ether 5 months previously; patient nearly died under ether.	6 weeks.	1 year. V=$\frac{20}{50}$
49	72	M	Good.	Senile, 1 year.	Cocaine; Graefe up; iritis with closure of pupil; iridectomy downward 11 months later.	4 weeks.	1 year. V=counts fingers.
50	89	M	Fair.	1 year.	Cocaine; Graefe up; smooth recovery.	3 weeks.	2 months. V=$\frac{20}{70}$

Of the whole number of eyes operated upon, twenty-four recovered good vision without any secondary operation, and seventeen after one or more secondary operations. As to secondary operations, *keratonyxis* was performed *once* in each of twelve cases, *twice* in each of four cases, and in *another* case it had to be followed by Dr. Agnew's hook operation *Iridectomy* was performed four times, thrice for closure of pupil, and once for artificial pupil, in order to avoid a corneal opacity. One of the three *lost* eyes had to be enucleated, to insure the safety of the fellow eye, which was operated upon successfully.

As to sex, the patients were pretty evenly divided, twenty being males and twenty-three females. Their ages ranged from thirty-eight to eighty-nine.

In seventeen cases the operation was done under ether, in twenty-seven under cocaine, and in six cases no anæsthetic was used.

Of the six cases in which no anæsthetic was employed, five were successes and one a failure. Of the seventeen in which ether was used, sixteen were successes and one a partial success. Of the twenty-seven operated upon under cocaine, twenty-one were successes, four partial successes, and two failures.

The resulting vision was:

Successes	($\frac{20}{15}$ to $\frac{20}{200}$),	41 = 82%
Partial successes	($\frac{20}{200}$ to counting fingers),	6 = 12%
Failures	(counting fingers to 0),	3 = 6%

One eye had vision = $\frac{20}{15}$, the best I have ever known of after a cataract extraction.

All the eyes were operated upon with *aseptic precautions*, either a saturated solution of boric acid, or a solution of biniodide of mercury, 1 part to 25,000, being freely used.

EXTRACTION OF HARD CATARACT—DEATH ON THE FIFTH DAY—EXAMINATION OF THE EYE.

BY HENRY D. NOYES, M.D.,
NEW YORK.

History.—Mrs. S. S. T., aged sixty-two, with cataract in O. S. complete, in O. D. incomplete, projection good, pupils active, was operated upon on the 25th of April, 1886, at ten o'clock in the morning. Cocaine instilled to complete anæsthesia and dilatation of pupil, lids separated by speculum, section through the upper $\frac{2}{5}$ of the cornea, strictly in the limbus, iridectomy of medium size, capsule freely opened in the middle by cystotome, expulsion of the lens by pressure and counter-pressure. The conjunctival sac was washed out with a solution of biniodide of mercury, 1 : 25,000, and the anterior chamber was irrigated with the same solution by means of a bulb syringe, the point of which was not introduced into the anterior chamber. The cortical substance appeared to be completely removed, the bleeding was moderate and the pupil became perfectly black. The iris was carefully replaced by a spatula and the action of the pupil was perfectly restored. The operation was smooth and without accident. Patient able to count fingers at one foot. A bandage was applied, and the patient put to bed. After three days the eye was for the first time briefly inspected. The anterior chamber was found to be restored, the wound united, the reaction very moderate. Patient had had no pain. Bandage re-applied and patient continued in bed. At 6 o'clock on the morning of the 5th day the patient was seized with great prostration and syncope, and, notwithstanding the use of stimulants and restoratives, she died in half an hour without pain or convulsion. At the autopsy, twenty-four hours later, the only lesion discovered was dilatation of the heart without hypertrophy.

The contents of the left orbit were removed en masse, and in so doing the wound in the cornea gave way. The specimen was at once placed in Müller's fluid, subsequently treated by alcohol, stained and sections prepared by Dr. H. Gifford with Thoma's microtome. The sections were made on a plane parallel with the vertical meridian, and out of a large number ten were selected and numbered in order, commencing from the nasal side and going over to the temporal side of the cut. Consequently the sections at the extremities of the cut pass through the cornea in planes oblique to its radii, and these sections go through the intact iris, while the middle sections go through the coloboma.

Description of the Sections.—Sections 3, 4 and 5, which come from the nasal side of the wound, exhibit an entanglement of the iris; sections 6 and 7 pass through the coloboma, while in sections 8, 9 and 10, on the temporal side, the wound is free from the iris. In other words, a prolapse of the iris took place on the nasal side of the coloboma which was not detected and it is believed did not exist at the time when the operation was finished, and to prevent which the spatula was carefully used. In section 4 the opening through the anterior capsule is displayed, and it is seen that the upper portion of it has been turned down and folded over so as to lie behind the iris; in section 6 the anterior capsule is seen to be loosely folded and wrinkled up. The posterior capsule is in all the sections intact. In the sections at the extremities of the wound a very small amount of lens matter is entangled within the capsule; in the middle sections no lens matter is to be found in the pupillary area, and in only one section, viz., 8, is any lens matter found in the anterior chamber, and in extremely small quantity. This indicates how perfectly cortical matter was removed by manipulation and irrigation. The hyaline membrane is everywhere intact. Sections 1 and 10 exhibit the extremities of the cut where the cornea was not completely divided; in section 2 one half of the corneal wound remains undisturbed with the material of union in situ; in all the other sections, viz., 3, 4, 5, 6, 7, 8 and 9, the lips of the wound have been separated and override or touch each

other at an irregular angle. At the middle of the cut it is evident that the blade of the knife was turned, because the line of the cut is curved. At the summit of the cut, as seen in section 7, the iris is divided very close to the ciliary processes, and the section through the cornea is 2 mm. from the angle of the anterior chamber, and the stump of the iris left, is 1 mm. in length, seen by a low magnifying power. Section 6 shows the stump of the same length. In section 5 the iris is caught in the wound. The thickness of the cornea on the proximal side is greater than on the distal side of the cut. This is especially noteworthy in all the sections except those at the extreme ends of the cut, and the proximal side of the cornea is looser in texture as shown by the spreading apart of the lamellæ and by the display of inter-lamellar spaces. The cornea itself has a slightly wavy outline, especially on the posterior aspect, and its middle is thinner than its extremities. The epithelium of the posterior elastic lamina has in almost all the sections disappeared. The epithelium of the anterior surface of the cornea, on the proximal side, exhibits great activity, on the distal side it shows but little proliferation.

In section 3, where the wound has not been entirely torn asunder, and where the iris is prolapsed into it for half its depth, the anterior epithelium of the cornea is in a state of active proliferation on the *distal* side of the wound, and to a higher degree than on its proximal side. On both sides of the cut the corneal tissue is crowded with lymphoid cells. Those on the proximal side form a stratum of marked density at a little distance below the epithelium, and they are found along a plane occupied by blood-vessels whose sections are seen in the tissue. The intercalated material in section 3 seems to consist of lymphoid cells imbedded in a homogeneous plasma, and similar cells crowd toward it from the adjacent corneal structure, more especially from the proximal side, and the intercalated material approaches the anterior surface of the cornea. The lymphoid cells, where they can be isolated, seem to be surrounded by a body which is more or less elongated, sometimes caudate, and the lymphoid cells then appear

as if they were nuclei. When the epithelial surface of the distal side of the cornea is inspected, the layer of cells is from 7 to 10 cells deep near the wound, and they lie not only flatwise, but obliquely, and in some cases almost perpendicularly to the surface of the cornea, and cannot be distinguished in form from those which occupy the intercalary plasma or callus of the wound. That portion of the cut of section 3 into which the iris penetrates has been opened by the slight withdrawal of the iris from contact with the borders of the cut, and the tip of the prolapse is covered by a pointed mass of rounded, oval, elongated and variously shaped cells imbedded in a homogeneous material. At this region the substance of the cornea is spongy, opened out by the separation of the laminæ, and very few lymphoid cells appear, while the corneal corpuscles are rather numerous. At this point, too, a small quantity of lens matter is found between the iris and the corneal cut. On the posterior surface of the proximal portion of the cornea, in section 3, the epithelial cells of the posterior elastic lamina are numerous and distinct.

In sections 4, 5, 6, 7, 8 and 9, it is on the proximal side of the cut that the epithelium takes on special activity. In section 10 it is pretty equally divided between both sides. In section 1 the epithelial activity is decidedly greater upon the distal side of the cut, and the cut itself is filled with a large mass of new-formed material apparently composed of lymphoid cells exclusively, and at one point these cells break through the epithelium just below the cut. In section 2 the epithelial activity is also greater upon the distal side of the cut, and lymphoid cells seem to be forcing their way through the epithelium of the surface, and the cornea below the epithelium on both sides of the cut is dotted with lymphoid cells. These grow less numerous as one approaches the posterior surface of the cornea. In section 4 the intense activity of epithelium is found on the proximal side of the cut, and in this region the corneal activity is especially noteworthy on this side and deficient on the other side. In section 5 the epithelial activity is very great on the proximal side and almost wanting on the distal side, and the same is true of the cornea. In section 6 the condition

is the same, and in this section the appearance is as if the epithelium had poured itself down into the cut and constituted the chief medium of connection between its opposite sides. The corneal substance is, however, permeated by numerous cells, all pointing toward the cut. In section 7 epithelial and corneal activity are by far the greater on the proximal side, and the appearances in this section favor very strongly the idea of epithelium having thrust itself into the cut. Section 8 shows the same appearance as regards the epithelium and the relative activity of the cornea on the two sides of the cut. In section 9 the epithelium of the proximal side is more abundant, while that on the distal side begins to show an increased activity as compared with the other sections; the cornea on the proximal side is in greater activity than on the distal. In section 10, where the cut through the cornea is incomplete, not reaching the posterior elastic lamina, the epithelium on the distal side exceeds in activity that on the proximal side; while on the proximal side the epithelium is in active proliferation, the distal side of the cut in this section overrides the proximal, and the intercalated material appears to be continuous with the epithelium of the proximal side.

A notable feature of the healing process is found in the great abundance of lymphoid cells in the layers of the cornea which lie some distance below the epithelium of the anterior surface of the proximal side, viz., the region in which blood-vessels can be traced. In every section saving those at the extreme ends of the cut this portion of the cornea is packed with an abundance of lymphoid cells forming a very conspicuous stratum. As we go back from the cut toward the sclera, along this stratum, the lymphoid corpuscles are found to be concentrically grouped around sections of blood-vessels, and they evidently have proceeded from these vessels, and are pressing forward toward the wound. In no portion of either the proximal or distal side of the cut is there such an abundance of lymphoid bodies as in this particular region, and their presence suggests the explanation of the well-known appearance to be seen in the early days after a cataract extraction which is known under the name of striped or striated keratitis.

A study of all the sections makes it evident that by far the larger portion of lymphoid cells which find their way into the wound come from this region and therefore proceed from the circulation. The deeper parts of the cut, lying next to the posterior surface, in all instances contain very few lymphoid cells, either in the cornea or in the cut itself, saving in those regions where the iris had prolapsed. Here the lymphoid cells proceed from the iris itself. In certain sections the lymphoid cells appear to be imbedded in a homogeneous, unorganized plasma.

In some sections a considerable quantity of molecular pigment appears in what may be termed the callus, and it is found also in the adjacent cornea; when in the cornea it appears as if it had entered it from the cut, except in its anterior layer where the blood-vessels are found. The pigment seems to be derived from the blood, although where the iris is prolapsed it might perhaps come from that. (It is proper to observe that this patient had taken nitrate of silver for some disease of the stomach, enough to discolor her skin and give the face and the conjunctiva the well-known dusky blue hue, but not to an intense degree—*i. e.* the condition known as argyrosis.)

In conclusion, it would appear that the healing process goes on with greatest activity in regions nearest to the blood-vessels, and that the healing is effected in large measure by proliferation of the epithelium of the anterior surface of the cornea, and that the activity of this epithelium is in direct ratio to its proximity to the circulation; while a second factor in the healing process is the proliferation of lymphoid cells, which make their way through the corneal structure most abundantly in its vascular parts, and therefore that this process is most active on the proximal side of the wound. The epithelium of the posterior elastic lamina takes no part in the healing process. Besides the new cells, a homogeneous, transparent, unorganized substance forms the plasma in which the cells are imbedded. Lymphoid cells and epithelium become mingled together, both in the callus and, in certain instances, upon the surface of the cornea, especially within the cut. In section 1, where the cut has passed through

only about one-fourth the thickness of the cornea, it is impossible to distinguish between lymphoid and epithelial cells, which are commingled together in the mass of callus. At a little distance from the cut lymphoid cells have pressed forward so vigorously as to force their way through the epithelium and to press it out in a papillary form. To the right and left of this spot the epithelium has been pushed aside. With regard to the fixed corpuscles of the cornea, they do not appear to be specially increased. In a few instances two are found situated in one cavity, but very seldom do they arrest attention. The activity of the healing process is found in the epithelium and in the lymphoid (wandering) cells, which in certain places mingle together so as to be indistinguishable.

Description of the Plates.—The illustrations are from photographs kindly made for me by Dr. Randall, of Philadelphia, and to preserve their absolute truthfulness the unavoidable blemishes of the original negatives have been allowed to remain. It will be easy to recognize them. The printing has been most skilfully done by Mr. Edward Bierstadt, of New York. Fig. 1 is taken from section 8, near the temporal side of the cut. The continuity of the epithelium with the callus and its wrinkled appearance are conspicuous. The deeper shading of the superficial half of the cornea is produced by the abundance of lymphoid cells, which come from the vessels situated in this region; one of them is seen in section. The great increase in the thickness of the cornea on the proximal side will arrest attention, especially when compared with the distal side, of which only the tip is shown. Some cortical matter is seen within the capsule.

In Fig. 2, taken from the middle, and being section 6 of the series, the print is less intense but the same general characteristics appear—viz., the increased thickness of the proximal portion of the cornea; the noteworthy proliferation of the epithelium; the shaded streak corresponding to the vascular region of the cornea; also the irregular curve of the posterior surface and the cell proliferation near the canal of Schlemm. The callus has, after the fracture of the edges, remained upon the proximal side, and the membrane of Descemet can be

traced around the angle almost to it. But there is no sign of cell activity in the vicinity of this membrane. The stump of the iris is conspicuous.

Fig. 3 corresponds to section 5 and shows the incarceration of the iris, which had been again pulled out when the wound was opened at the removal of the eye from the cadaver. The picture is quite free from technical blemishes, and shows well the pathological conditions of the cornea.

Figures 4 and 5 approach still nearer to the nasal extremity of the wound and correspond to sections 3 and 2. In fig. 4 the spreading out of the corneal substance, as indicated by the spaces between its fibres, evidences the œdema and swelling of the tissue. The prolapse of the iris is deeper, and the tip of the iris seems to have been pulled away from the intruding epithelium of the anterior surface. Fig. 5 shows the wound not broken open on its outer or superficial portion, and well displays the wavy and irregular line of the corneal epithelium, both on the proximal and distal sides of the cut. Proliferation has taken place in the distal part of the cornea more abundantly than in the other sections. It is also seen that the iris entered to a very slight degree into the cut at this point. The sphincter, or rather the pupillary margin, was nowhere incarcerated. This was seen during the patient's life when the eye was viewed on the 3d day, and at this time the anterior chamber was full. The sections demonstrate that the healing process occurs with greatest activity upon the outer or external surface of the cut, by the agency of the epithelium and of the vessels not far below Bowman's membrane. It may happen that an open space may for some time remain upon the inner (posterior) edge of the cut, and should any leakage occur of aqueous humor during the period when union of the superficial part of the wound has been incompletely established, the iris may find its way into the open space and there remain and grow adherent. It seems necessary to frame some such explanation of the prolapse, because when the eye was first bandaged the restoration of the iris was perfect, so far as could be judged. There can be no doubt that a corneal wound does not unite simultaneously throughout the whole extent of the opposing

surfaces; on the contrary, this case exhibits a marked disposition of the superficial part to unite the most quickly. Again, the swelling of the proximal portion of the cornea and the notable difference between the thickness of the opposed edges seen in this case upon the 5th day make it evident that the edges of the cut upon the deep surface cannot come into accurate co-aptation, but must form a slight ridge. This is demonstrated in figs. 4, 3, 2, 1. Evidently an opportunity is thus afforded for the iris to intrude, in case some small leakage permits it for only a short time to float up to the cornea. The distance which separates the cornea from the iris at the periphery of the chamber is so trifling that actual contact is extremely easy, and the parts may readily by prolapse become adherent. A degree of mystery hangs about the mechanism of prolapsus iridis after cataract extractions. It is certain that it is not always due to imperfect replacement at the conclusion of the operation. Doubtless this accounts for the larger number of cases, but there are some instances in which this fault may be excluded. More especially does this apply to the cases where no iridectomy is done, and the operator necessarily uses the utmost care to restore the iris. But sometimes prolapsus occurs. I think the above suggestions afford a partial explanation. It may in addition be remarked, that if there have been an unusual degree of manipulation of the wound in expelling cortical matter or blood, or if for any reason the wound has been roughly treated, the corneal tissue will swell more freely, the discrepancy between the opposed lips will be a maximum, and thus by imperfect union of the deep surfaces an invitation may be given to prolapse.

Fig. 6 shows the anterior capsule turned back upon itself.

Fig. 7 presents a portion of the retina near the ciliary region which had undergone in a marked degree the cystoid degeneration which is frequent in old persons.

DISCUSSION.

DR. JEFFRIES.—Have any of the gentlemen used cocaine in both eyes in cataract extractions? I have used it with great advantage. It needs but one drop, a minute or two

Fig. 1. Section 8. · 35

Fig 2. Section 6 · 35

Fig. 3 Section 5 · 35

PLATE 2.

Fig. 4. Section 3. · 35

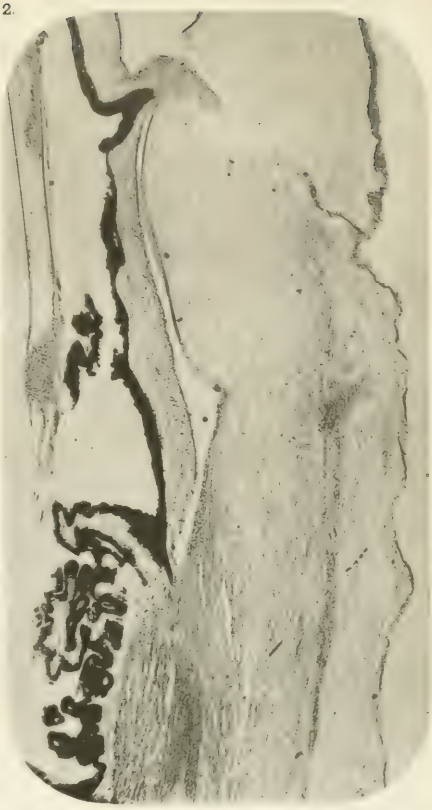


Fig 5. Section 2 · 35

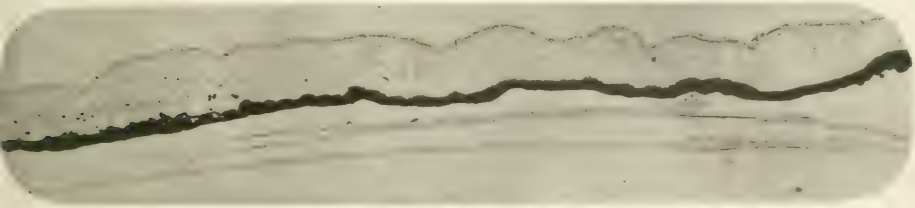


Fig 6 35

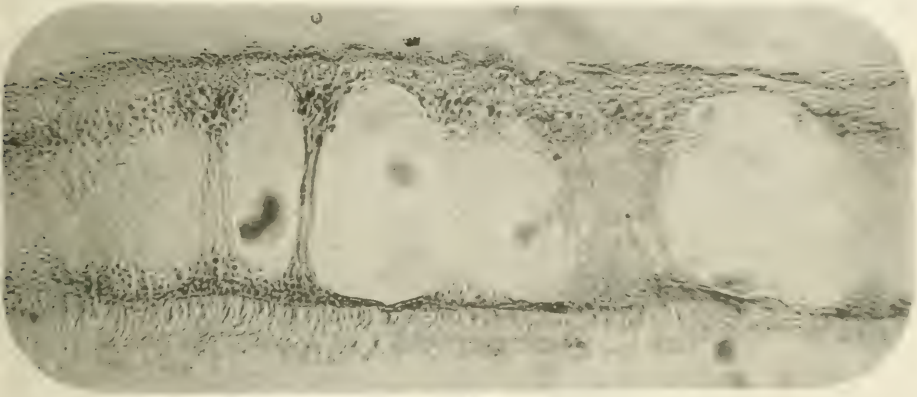


Fig 7. · 60

before the operation. The eye remains quieter, the patient can keep it open, and in one or two cases I have found it of decided benefit.

I would ask Dr. Knapp if he, when in Vienna, saw Arlt use the little double hook for the removal of the lens which he described in the Archiv?

Dr. Knapp.—I have not seen it.

Dr. Jeffries.—When I saw the description of it I remembered seeing such an instrument in an old case of my father's of fifty years ago. It consists of two hooks on the ends of springs. Arlt squeezes them together, introduces them into the vitreous behind the lens, opens them and removes the lens. It occurred to me that it would be better to put a little rivet through the springs with a screw nut, so that the width of the hooks apart might be regulated. It is impossible to keep the springs just so far apart by the fingers. I have only used it once. It seems to me that where we want to act quickly this might be of decided advantage. I am generally averse to new instruments. I have never invented one, but as Arlt speaks so well of this double hook, I think it worth having in our boxes.

Dr. Webster.—A word in regard to the use of cocaine. The longer I have used it the more have I thought that I saw the necessity of using very little of it in cataract extractions. Some of my cases which have done badly, I think have been due to the use of too much cocaine, the amount of reaction being very considerable. In my later cases, I have done about as Dr. Strawbridge has suggested, putting cocaine in but two or three times. I have used a four per cent. solution.

Dr. Agnew.—I would say a word with reference to the quantity of a four per cent. solution of cocaine which seems to be necessary. When I first began its use, I fell into the natural error of repeating the instillations too often. In the light of what I have seen of the reaction after cataract extractions with cocaine, apparently due to the effect of cocaine, I am prepared to say that the better method is to drop upon the surface of the eye a single minim of a four per cent. solution, hold the eye-lids open for a portion of a moment, in order that the fluid may diffuse itself over the entire surface of the eye, and then wait for three or four minutes. The surface of the eye should be touched with an instrument, or with the finger which has been cleaned in an antiseptic solution to ascertain whether sensation is sufficiently obtunded. In using cocaine in that manner, one will often get sufficient insensibility from one or two drops, and not produce that

condition which tends to evil in the after-result. With this precaution of feeling our way, we may get great benefit and reduce the possible evil effects to the minimum. While in not more than one or two cases I have had occasion to regret the result, yet I have seen reaction several times from excessive use of cocaine, which has caused me to pursue the cautious course indicated above.

In the after-treatment of cataract extraction, I have frequently made use of a method which I learned from my colleague, Dr. Gruening. If you let a pencil of light enter a room through an aperture in the shutter, you will see that the air is full of floating matter. If you expose the eye under such circumstances, there must be a deposit of this foreign matter or filth, but if a solution of boracic acid or some other detergent is used, the risk of a deposit of dust or filth in the wound is reduced to a minimum. If the surface of the eye is kept flushed by such wash it is kept cleaner. In this way boracic acid may be of service, although it may be difficult to attribute antiseptic value to its chemical properties. I also use a solution of biniodide of mercury (1-25000) during the progress of almost all capital operations upon the eye.

Certain allusions have of late been made to the after-treatment of cataract operations, looking to the revolutionizing of the methods of after-treatment, by keeping patients in more light. Thirty years ago, coming back from abroad, I adopted the plan learned from Wilde of Dublin and employed also in the Royal London Opththalmic Hospital, of closing the eye after cataract operation or iridectomy with two narrow strips of isinglass plaster, each one-fourth of an inch wide, placed across the centre of the palpebral slit. For many years I used that method exclusively. It was not until Graefe so influenced us, that I resorted to the use of a modified method of bandaging. In my experience, it has never been the practice to incarcerate patients after a capital operation on the eye in a dark room. The institutions with which I have been connected have always been as light as any other hospitals.

THE PRESIDENT.—I would ask Dr. Agnew how much anæsthesia of the iris he obtains by the use of cocaine in the manner suggested?

DR. AGNEW.—If I find the patient will stand the contact of my finger, I feel that I have sufficient effect. After making the preliminary cut, if I encounter any return of sensibility, I may put a small drop at the site of the wound. I try to reduce the number of drops to one or two, or to three at the most. The precaution should be to use the minimum amount of cocaine.

Dr. Mittendorf.—Like previous speakers, I have had two cases of serious complication after cataract extraction which I thought I had to attribute to cocaine. In one, the eye was lost, and in the other, it came near being lost. The cocaine solution was absolutely fresh, but it was strong and used quite freely. I have thought that one reason why it acted so badly was because, after getting partial anæsthesia, I introduced the speculum and poured the cocaine solution in large quantity upon the cornea, leaving the eye exposed for four or five minutes to the air. According to recent observations, the injurious action of cocaine is especially upon the epithelium of the cornea and in shutting off the supply of lymph fluid. The epithelium suffers very rapidly from lack of moisture, especially if the eye is kept open. It has been recommended and I have done so lately, to close the eye immediately after dropping in the cocaine. This may be of interest in regard to the case of Dr. Noyes, which shows healing going on from the epithelium. If the epithelium suffers from the action of cocaine, the healing process must be interfered with.

Lately I have been using a very weak solution, making it fresh every day by dissolving one or two grains of cocaine in half an ounce of water. Since I have been using the method of keeping the eye closed and using the weak solution, I have had no serious accident whatever.

Dr. Thompson.—I might say a word in regard to the efficacy of weak solutions of cocaine. The first time I used cocaine, I told the apothecary to make a two per cent. solution. I learned afterwards that he had made it of the strength of two grains to the ounce. I did two or three operations with it with perfect success. Since that time I have felt that it was not necessary to use a four per cent. or even a two per cent. solution.

Dr. Gruening.—I shall make only a few remarks in regard to extraction of cataract without iridectomy. Last summer I was in Paris and I went to De Wecker's clinic to see him perform this operation. He, however, performed iridectomy. I said to him that I had heard that he performed cataract extraction without iridectomy. He replied that he did so in the winter, but not in the summer. He said that the patients were very restless during the hot summer nights, and that he had observed many cases of prolapse under such circumstances. I concluded to try the operation when I returned, and in May, 1880, I performed my first operation. I instilled a few drops of a solution of eserine (half a grain to the ounce), half an hour before the operation. A few minutes before the operation, the eye was

cocainized with a four per cent. solution. I had no difficulty whatever in delivering the lens. The iris returned spontaneously. I instilled eserine again and bandaged the eye. Forty-eight hours after the operation, I removed the bandage. The patient pressed his lids, the anterior chamber was emptied and the iris prolapsed. I was compelled to excise the iris. There was no further accident.

A few days later, I performed a second operation. I used eserine as before, cut through the clear portion of the cornea and had no difficulty. The iris returned spontaneously. The bandage was removed four days after the operation. There was little iritis and excellent vision. The patient was discharged on the eighth day with excellent sight. I shall cultivate the method and hope to obtain as good results as have been reported. The use of eserine favors the retention of the iris.

With reference to the action of cocaine on the cornea, I can give an extreme example. A case of chronic glaucoma, with an exacerbation of the symptoms, was to be operated on by sclerotomy. The eye was very painful and very hard, and I directed the house surgeon of Mount Sinai Hospital to instil a six per cent. solution of cocaine. He did so. When I introduced the speculum I saw rise before me a large bladder. I removed the speculum and the bladder collapsed, and I found that it was formed by the epithelium of the cornea which had suddenly been raised when I introduced the speculum. The epithelium was lying in several folds on the cornea. The anterior chamber was emptied and the eyeball was soft. The osmotic condition of the cornea must have been so changed by the action of the cocaine and the high pressure that it allowed the aqueous humor to escape through its wall. The aqueous humor soon collected again. Later it became necessary to remove the ball.

DR. THOMPSON.—This brings to my mind an observation which I made some time ago in a somewhat similar case of glaucoma on which I was about to perform iridectomy. The instillation of cocaine failed to produce any analgesia. Although it was instilled several times, sensibility was not diminished. On attempting to do the operation without ether, I was obliged to desist. After the operation had been completed, it occurred to me that the increased tension might have something to do with the non-absorption of the cocaine. After the effects of the ether had passed off, I again introduced cocaine, and in the usual time the cornea was found to be analgesic.

Dr. Noyes.—In regard to cataract extraction without iridectomy, I may add my experience. Having witnessed the operation in Paris, I resorted to it during the past year, and in six cases have performed extraction without iridectomy. Cocaine was invariably used. The anterior chamber was cleansed partly by manipulation and partly by irrigation. The anterior chamber may be conveniently washed so as to expel blood and cortical matter without the use of a syringe. In the beginning, following the example of Panas, I attempted to use such an instrument. I soon gave it up and resorted to a rubber bulb holding two or three ounces of water and furnished with a small, short stem. This answers for the preliminary irrigation and facilitates the removal of clots. A stream of water directed on the wound enters the anterior chamber and serves to expel its contents. I have found it unnecessary to introduce any instrument between the edges of the wound. I have accomplished all I wished by external irrigation. I have also succeeded in replacing the iris by a stream of water, although I have no hesitation in replacing it with an instrument when necessary. I have also resorted to the use of eserine for the purpose of keeping up contraction of the iris, not as a preliminary to the operation, but as an after-dressing. I use an ointment containing two grains of eserine to one drachm of vaseline. A small portion is put in the conjunctiva and a little is placed on the patch in contact with the eye. The eyes have been kept closed for three or four days, and in some instances the lids have not been opened for from five to seven days.

The result in these six cases has been, in three, perfect union with a central, circular pupil and accurate vision. In the second eye of one of the patients, whose first eye is included in the three successful cases already mentioned, the result was rendered entirely negative by the occurrence of large intra-ocular hæmorrhage within twelve hours after operation. This ruined the eyeball, but might happen after any method of operating. In the other two cases, prolapse of the iris was found on the seventh day, when the eye was examined for the first time. The prolapsed iris was excised, and in one of the cases the result in the end was completely satisfactory and the case had no other issue than if the usual operation had been performed. In the other case, considerable corneal opacity ensued, and notwithstanding the second operation, no satisfactory vision was obtained. The patient submitted to an operation on the other eye, which was done with an iridectomy.

The impression on my mind from this small series of cases is that while the operation does offer great temptations, one must be careful in the selection of cases. It is my feeling that if a patient had only one eye to be operated on, I should do it with an iridectomy and not without. I believe that a satisfactory result can more certainly be obtained with an iridectomy than without. At the same time I am aware that Prof. Panas says that in his earlier experience prolapse of the iris was more frequent than it is now. That may be the result of greater experience.

As to the visual result, theoretically it should be better, but I think such is not always the case.

DR. THEOBALD.—I have observed one striking case of the action of cocaine on the epithelium of the cornea. This was a case of stricture of both nasal ducts, in which the repeated probing was done under the influence of cocaine. Previous to the instillation of the cocaine, the cornea would be clear and bright, but after its instillation it invariably looked as though it had been roughly handled, the epithelium being abraded and the surface of the cornea decidedly uneven. This happened every time that cocaine was instilled, and always produced a temporary blurring of sight.

I recall another instance in which cocaine was applied for the removal of a small foreign body in the cornea. Following this there was the same peculiar effect on the corneal epithelium, which continued for two days.

DR. FRYER.—In about ten cases of extraction of cataract, I have used cocaine in the following manner: put a single drop in the conjunctival sac every half hour until four or five drops have been used. In that way the iris becomes perfectly anæsthetized, which is important where we expect to do an iridectomy. In the cases in which I have used this method I have seen no trouble, while the anæsthesia was complete. I believe that Koller speaks of this method or something like it in his second paper on cocaine.

DR. RANDALL.—There is one point not distinctly referred to in the discussion relating to the extraction of cataract without iridectomy, that is, whether inflammation of the iris is more frequent in these cases than where an iridectomy is performed. The object of the iridectomy is, I take it, to make the exit of the lens freer and to avoid bruising of the iris. In the thirty or more cases of extraction without iridectomy which I saw in the clinics of Panas and Galezowski, two years ago, there was not a single case of iritis. There were, however, several cases of prolapse. Panas claimed that there

was less iritis after this operation. In regard to the pupil, it is proper to say that with a small iridectomy as round and as perfectly movable a pupil as any I have ever seen, can be obtained.

A MODIFIED LORING OPHTHALMOSCOPE, WITH A DISK OF CYLINDRICAL-LENSES.

BY B. ALEX. RANDALL, M.D.,

THE instrument here presented was designed by the writer in most of its essentials six years ago; but has only recently been actually constructed, after closer study had shown more certain grounds for its claims to meet some hitherto unsatisfied requirements. The later ophthalmoscope of Dr. Loring (Trans. Am. Ophth. Soc., Vol. II., p. 489, 1878) has been the type kept in view, and the deviations from it have been made as slight as possible. The lenses are placed as in the instrument of Dr. Noyes, and differ from them only in slightly increased diameter and smaller number. They are + 1., 2., 3., 4., 5., and — 1., 2., 3., 4., 5. and 6. D. spherical in the main disk; while the supplemental disk contains concave and convex 0.5 and 13. D. on each side of its zero opening. The main disk is rotated, as in the Loring ophthalmoscope, by the finger pressed upon its milled edge; the secondary disk or quadrant, by means of a cogwheel 18 mm. in diameter, below it. This cog is provided with a spring-stop to centre at the sight-hole the lenses which it controls. The instrument is figured in its simpler form (Fig. 1) without the cylinder lenses, the dotted lines showing the slight change required to adapt it to this addition. The adjustment of this disk of cylinders has been already described (Med. News, Oct. 17, 1885, p. 442); and is sufficiently well shown in Fig. 2 to need no explanation, further than to note that the series of *concave* cylinders can be placed with their axes in any desired position (*e.g.* vertical as shown by the dotted lines), and give any sphero-cylindrical combination or its equivalent.

The figures marking the lenses, as they are generally placed, are concealed by the addition of this disk, and they have accordingly been transferred to a position nearer the handle, where they will always be visible.

FIG. I.

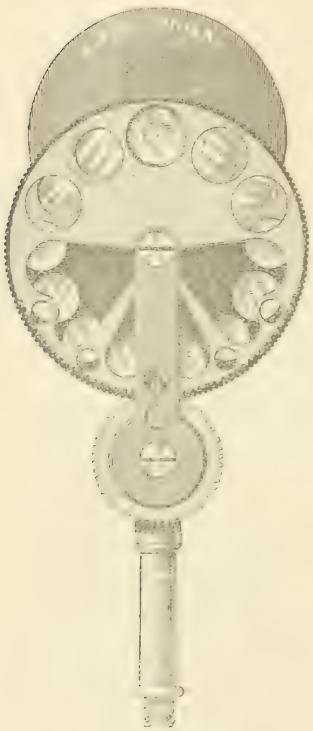
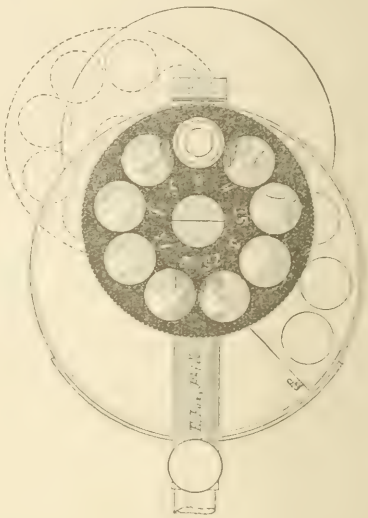


FIG. II.



The maximum thickness, when the disk of cylindricals is added to the instrument, is 10 mm., and the weight[1] 47.4 gm., as compared to 7.75 mm. and 45.2 gm, of the Loring; without the cylinders it is practically identical with the latter in thickness, weight and balance—a point worth emphasizing. The simple change of the lower journal of the tilting mirror into a spring clip, makes it a matter of but an instant to remove the

[1] Superfluous metal is removed from both disks by boring openings not shown in the cut.

usual concave-mirror and substitute a plane, or weak-light mirror when desired.

The advantages afforded by the new arrangement (at cost of but moderate increase in complexity) are the ready availability of the lenses of the supplemental disk or quadrant and their self-centering, so that any lens or combination can be called into use without removing the instrument from the eye; and the addition in practicable form of a full series of cylindrical lenses for ophthalmoscopic work.[1] The increase in cost is not great, and the instrument (as constructed by E. Fox, of 17th and Chestnut Sts., Philadelphia) has proven satisfactory in practice.

ADVANCEMENT OF TENON'S CAPSULE IN STRABISMUS.

BY H. KNAPP, M.D.,
NEW YORK.

WHEN at our meeting of last year Dr. Holt advocated the correction of higher degrees of convergent squint by a tenotomy of the contracted muscle and a simultaneous advancement of its antagonist, I opposed this plan, because I was—and still am—convinced that the highest degrees of convergence can be corrected by one tenotomy on each internal rectus, and further, because I considered advancement not quite a safe operation in all cases. Visiting the ophthalmic clinics of Berlin and Paris last winter, I was surprised to find that with Schweigger, Hirschberg, Landolt and others, this plan was a subject of ordinary practice. They claim for it that the correction obtainable by it is as certain as with one or two simple tenotomies; moreover, that protrusion of the eyeball and secondary divergence are less likely to occur. Taking further into consideration how pleasant it is to remove

[1] As has been [illegible], the disk [illegible] is applied to the Loring and other instruments, the only disadvantage being the concealing of the figures marking the lens at the sight-hole.

the disfigurement in one sitting, and not to be obliged to attack the good eye, we can readily appreciate the advantage of this new plan of operating over the old. Instead of the ordinary advancement, I saw De Wecker and Panas perform the advancement of Tenon's capsule. I have not been able to form a competent judgment of the value of this operation, for that would have required a long observation of a great number of patients thus treated. Nevertheless, I decided to try the procedure, for I knew well enough that the ordinary squint operation had more than one weak point.

The advancement of Tenon's capsule was devised by De Wecker five years ago. He executes it in the following way: A piece of conjunctiva, 5 mm. long and 10 mm. high, is detached from the region of the insertion of the tendon as a centre, leaving a small band near the cornea. Tenon's capsule, now exposed to a great extent, is incised near the insertion of the tendon, and loosened alongside and underneath the muscle. The capsule is then stitched forward by two sutures, entering through the conjunctiva and the capsule at the upper and lower edges of the muscle, and coming out in the conjunctiva above and below the cornea. The greater the piece of capsule which is loosened and stitched forward, the greater the effect. Immediately after the operation there should be some divergence. The sutures are removed the next day, if the effect appear too much, otherwise they are left in place three or four days.

De Wecker uses the capsular advancement for cases of insufficiency, to strengthen the weak muscle, and for high degrees of strabismus, both convergent and divergent.

Since June 5th, of this year, I have performed the capsular advancement in ten cases. The operative procedure has differed from De Wecker's in the majority of the cases. I have left a greater conjunctival flap, undermined it, and stitched the capsule and the folded muscle by a third (middle) suture under the conjunctival flap at the cornea. My intention was to advance the whole anterior portion of the vertically folded muscle and capsule, and, by the sutures passed through it and drawn tight, to produce a plastic inflammation which

through subsequent cicatrization would not only advance but also contract and shorten these parts. In the last case I passed the third suture through the equatorial flap of the conjunctiva, through the tendon (which was held up, drawn forward and folded with a squint-hook) underneath the squint-hook, and through the episcleral tissue and the flap of conjunctiva near the cornea. This procedure is, in reality, an advancement of the tendon without detaching it. If I am not mistaken, I have seen similar operations in Paris, the sutures that advanced the capsule grasping also a portion of the edges of the muscle. The central suture, which I do not remember having seen, may be superfluous, but it is an additional support to hold the tendon and capsule forward, and is likely to assist in securing the desired effect by more extensive formation of cicatricial tissue.

The ten cases in which I performed this operation may be grouped as follows:

Two cases of convergent strabismus, the consequence of old paralysis of the external rectus. In both cases the cornea could not be moved beyond a straight forward position. To increase the effect in these cases, I not only applied the third suture, but after having united it, passed it through the skin of the outer commissure, drawing the globe outward as far as possible. The effect in these two cases was a vast improvement, the eye that had lain almost buried and inert behind the caruncle, could now be approached to a point 4 mm. from the outer commissure, showed a convergence of from 2 to 4 mm., but moved concomitantly with the other eye. The formerly paralyzed external recti had regained a considerable degree of power.

Two cases in which former tenotomies of the internal recti had not removed the strabismus. In the one case, I made a tenotomy of the internal rectus with capsular advancement of its antagonist. The effect was somewhat too large after the removal of the sutures, but gradually diminished, and when last seen the patient had an extensive field of binocular fixation. In the other case, one internal rectus had been divided, by myself, a year previously. The eye had been straight at first, but

gradually fell back into a convergence of 5—6 mm. I advanced the capsule of the external rectus of the same eye without tenotomy of the internal. The eye, three weeks after the operation, was straight most of the time, showing, every now and then, some accommodative convergence, which, however, has diminished during the last week.

Six cases of high degree of convergent strabismus, with considerable amblyopia in the squinting eye. In all of these cases I made a tenotomy of the internal rectus and a capsular advancement of the external. The results in all have been quite good.

In none of the cases was there any alarming reaction, though there was for some weeks redness and swelling of the region of the advanced capsule. At first I used catgut sutures, but one having given way over night I was glad that I had two others to rely upon. Since then I have used silk sutures. The operations have been done with antiseptic precautions, Panas's liquid being used for the sterilizing of the conjunctival sac, the wound, the instruments, and the sutures.

I have preferred this operation to the ordinary advancement, because it is simpler and less risky. The preservation of the natural attachment exposes the muscle less to inflammation, and there can be no undue retraction in the case of a failure.

It results from the foregoing that my limited experience with the advancement of Tenon's capsule has been quite encouraging.

DISCUSSION.

DR. HOLT.—I commenced to advance the rectus in certain forms of strabismus seven or eight years ago. In the first case I operated on, it was practically an advancement of Tenon's capsule, and the result was very satisfactory. I think that the operation of advancement cures nystagmus when it occurs in certain forms of squint; that has been my experience in several cases.

I have performed the operation twenty-seven times, and I have had but one case that gave any trouble, and that came out as well as any case that I have ever had.

DR. HARLAN.—Does Dr. Knapp consider this a safe operation? Five or six years ago, I did the operation in a number

of cases and was much pleased with it, until finally it was followed in one case by pan-ophthalmitis. At that time antiseptic precautions were of course not employed.

DR. KNAPP.—I did not consider it a safe operation one year ago, but since that time my views have considerably changed, as the result of experiments and of increased knowledge concerning the antiseptic treatment of wounds. More traumatic injury to the eyes is borne with impunity, than I would before have ventured to inflict. I think that it will not be possible to exclude suppuration in all operations, but where it occurs we must regard it as the result of infection and not due to the traumatism alone.

A CASE OF TUMOR OF THE LEFT OCCIPITAL LOBE WITH RIGHT HOMONYMOUS HEMIANOPSIA (WITH AUTOPSY).

BY EMIL GRUENING, M.D.,
NEW YORK.

IN 1855 Von Graefe pointed out the importance of the examination of the visual field in amblyopic affections, and foretold that the hemiopic visual defects would become important in the study of the intra-cerebral optic paths and centres. Since that time clinical ophthalmology has been cultivating the methods of examining the field of vision. As one of the many beautiful results yielded by this mode of functional examination, we may mention the clinical demonstration of the semi-decussation of the optic nerves in the chiasma.

At the present day the physiologist Munk teaches that the primary visual centres occupy circumscribed regions in the occipital cortex, and that the visual area of each occipital lobe connects with the retinæ of both eyes in such a manner that the right half of each retina belongs to the right occiput, and the left half of each retina to the left occiput. But modern physiology, as taught by Goltz, maintains that Munk's views have been derived from insufficient and erroneous observations, and

that all attempts to map out in the cortex of the brain a mosaic of functional districts have hitherto proved futile.

Thus, in regard to the localization of functional centres in the cortex of the brain, we have a positive and a negative modern school of physiology. The tenets of these schools are now being tested by clinical observations and pathological facts.

Clinical medicine and special neurology vie with each other in the study of the visual field, as predicted by Von Graefe.

Already certain lateral defects of the fields of vision, when combined with special groups of symptoms, allow the diagnosis of localized lesions of the brain. Aside from the well known tractus hemianopsia, we diagnosticate at present a thalamus hemianopsia, a fasciculus hemianopsia, and a cortex hemianopsia. Thus far clinical observation and pathological examination corroborate the physiological views held by Munk.

In America two cases of hemianopsia with autopsy have recently been published, the first by Dr. E. C. Seguin in the January number (1886) of the Journal of Nervous and Mental Diseases, edited by Dr. B. Sachs, the second by Dr. E. G. Janeway, in the May–June double number of the same Journal.

The following case of right homonymous hemianopsia, caused by a tumor of the left occipital lobe, came under my observation:

History.—Frederick Henkler, a tailor, fifty-five years old, consulted me in October, 1883.

He gave a good family history, and said that he himself had always been healthy. He had not acquired syphilis. In October, 1882, he had been attacked by severe pain in the left temporal region. The pain radiated from the temple to the occiput, lessened toward evening, and vanished during the night. Sleep and digestion were not disturbed. In April, 1883, he observed that his vision had diminished, and an examination made by an oculist revealed that he could see nothing on his right side.

Iodide of potassium was then prescribed. This, however, did not improve his condition, but rather, as he thought, caused indigestion. Frequent vomiting soon followed. The

summer of 1883, he spent in the country. In spite of the use of the iodide of potassium, the headache increased, and the vomiting continued. The headache became very violent in the night. In this condition the patient returned to the city, in September, 1883, and found his visual power greatly diminished. Soon afterwards he consulted me. The examination showed that the right halves of the fields of vision were lacking. It was a case of complete and absolute right-sided hemianopsia. The line of separation was vertical and fell about two degrees beyond the point of fixation. The left halves of the fields of vision were peripherally contracted. In the horizontal meridian the field of vision of the right eye measured only forty, that of the left eye fifty-five degrees, instead of sixty and ninety. Central acuity of vision was reduced to $\frac{20}{50}$ in each eye. The color perception was still good and the pupillary reaction prompt. The ocular muscles were not disturbed.

By the ophthalmoscope both papillæ were seen to be prominent, their outlines indistinct, the retinal veins broad and tortuous, the arteries threadlike. He presented the typical picture of choked disk.

Several weeks later the patient was examined by Dr. Landon Carter Gray, who had the kindness to write to me about him as follows: "The patient has an unsteady gait. This symptom may depend upon the visual disturbance. No staggering with closed eyes. The lower portion of the left half of the face is slightly paretic. There is a slight right-sided hemiparesis and hemianæsthesia." I did not see the patient again. In February, 1884, Dr. Pinner, the family physician, wrote me that the patient was dead, and that his friends allowed an examination of the head. Dr. Schapringer kindly assisted me in the autopsy.

Autopsy.—On opening the cranium I found the dura mater very tense, the convolutions flattened. The left hemisphere was larger than the right. The pons was displaced to the right. Apart from this displacement, the base of the brain showed no anomaly. In viewing the surface of the brain a hard mass was detected, occupying the posterior part of the left occipital lobe. The entire tip of the occipital lobe was re-

placed by this tumor. After removing the pia mater from the occipital lobe, the greater part of its second convolution and its entire first and third convolutions were found to be changed into a soft, almost liquid substance, covering the hard mass of the tumor. At several points the latter rose beyond the surface of the convexity of the brain. When the brain had become sufficiently hardened in Mueller's fluid, an incision was made through the left hemisphere, at the distance of 2.5 centimetres from the median line. The incision passed through the mass of the hard tumor, which was enclosed in a capsule and measured about ten centimetres in diameter. The white substance of the occipital lobe was almost entirely destroyed by the growth. The white substance underlying the gyrus angularis had also disappeared. The optic nerves, the chiasma, the optic tracts, seemed normal to macroscopic inspection. The pulvinar and the corpus geniculatum laterale were slightly flattened, probably from the pressure of the tumor.

The tumor was examined by the microscope and found to be a spindle-cell sarcoma.

Remarks.—The first alarming symptom in our case was the persistent headache, the second the diminution of vision. The ophthalmoscopic examination revealed the choked disc, the functional examination the right lateral hemianopsia. The continuous headache, the repeated attacks of vomiting, and the existence of choked disc, indicated the presence of a tumor in the brain, while the right homonymous hemianopsia indicated that this tumor was situated in the left hemisphere. We know that such lateral hemianopsia may be caused by disease (1) of the tractus, (2) of the thalamus, or the second optic centres, (3) of the fasciculus of Gratiolet, and (4) of the occipital cortex, or the first optic centres. In conjunction with the hemianopsia, we noted in our case right hemianæsthesia and hemiparesis. This combination of symptoms allowed the exclusion of both the pure tractus hemianopsia and the pure cortex hemianopsia.

The association of hemianopsia with hemianæsthesia and hemiparesis argued for either an affection of the thalamus

(pulvinar, second centres) or the fasciculus of Gratiolet (white substance of the occipital lobe). The absence of convulsive movements, the tardy appearance of the hemianæsthesia and hemiparesis were valid arguments against the existence of a lesion of the thalamus. The clinical course of the case justified rather the assumption of the presence of disease in that portion of the white substance of the occipital lobe where the optic paths traverse the posterior division of the internal capsule.

DISCUSSION.

Dr. Noyes.—I should like to hear Dr. Gruening's opinion in regard to the statement made two years ago that lesion of the cortex is capable of producing total blindness of the eye of the opposite side.

Dr. Gruening.—There is no such case on record. In the forty-five cases collected by Dr. Seguin, no such case is included.

Dr. Loring.—I think that Charcot's scheme was gotten up for that purpose. Ferrier also claimed that there was total blindness when the angular gyrus was destroyed.

Dr. Gruening.—I speak only of clinical observations verified by pathological examinations. Those were physiological experiments on lower animals. The facts which I present are derived only from clinical observation with pathological confirmation.

Dr. Loring.—Do you mean to say that Hughling Jackson's case is not on record?

Dr. Gruening.—It is not on the list of Dr. Seguin. These are only cases in which post-mortem examinations have been made.

Dr. Wadsworth.—In regard to Charcot's scheme, it has been stated by one of the New York neurologists that he had recently been present at a lecture by Charcot, in which he used the ordinary scheme and had apparently abandoned his old one. It has also been stated that Féré, who was Charcot's pupil and formerly used his scheme, had given it up. I think that the evidence is all against Charcot's scheme. Of the cases which have been reported, I do not remember any clean case of blindness of one eye from injury of one side of the brain. Such cases as the result of experiment have been reported, but they may be explained in other ways than as the direct result of lesion of only one side of the brain. When total

blindness of one eye has been accompanied by neuritis, the neuritis may be the cause of the blindness.

DR. JACKSON.—I think that Charcot's scheme, which was proposed several years ago, was proposed to explain the cases then on record, and the results of experiments on the lower animals. The cases on record at that time had not been observed as carefully as those reported within the last few years. In a large number of those cases the only testimony as regards the field of vision was the statement of the patient. A patient might state that he was blind in one eye, when perhaps he was only blind for objects toward one side. He would notice blindness which affected the nasal side of the retina, while he might not notice that which involved the temporal side of the retina, and in these cases central vision is nearly always preserved, unless there be some complicating lesion.

In reference to the lower animals, I think that there is none in which anatomical investigation shows the same arrangement of the afferent fibres of the optic nerve as in man. In most the decussation is complete, which makes the arrangement analogous to that of other afferent nerves. The same analogy is preserved in the case of human beings. There are few animals in which there is any approach to binocular vision. Their right eyes see objects on the right side, and their left eyes see objects on the left side; so that in the lower animals complete blindness in the opposite eye is analogous to blindness of the right or left halves of both retinæ in the human eye. I am sure that Charcot has abandoned that explanation.

DR. MITTENDORF.—I would ask whether or not the original idea of Munk, which I do not see indicated on the chart, of partial overlapping of the central occipital fibres in the median line, is still adhered to? Was that omitted on purpose?

DR. GRUENING.—I think that Munk does not adhere to that view. The explanations intended to throw light into other cases of hemianopsia have not been successful. This seems to me very clear and is based upon pathological observation. It is furthermore confirmed by anatomical investigations, especially by the degeneration methods of Gudden and also by the latest physiological facts found by Munk.

DR. MITTENDORF.—I think that Dr. Gruening did not understand my question. I think that Munk maintained that some fibres from one side would run to the other, and thus cause a partial decussation of the central fibres in the median line at the seat of origin, the gray matter of the occipital lobe.

DR. GRUENING.—In my studies I have not met with the statement that there is a commissure between these fibres.

DR. NOYES.—I might add a word in regard to the situation of the visual centre in the cortex. In the first experiments of Ferrier, it was located in the angular gyrus; later this was extended. I had an opportunity a year ago to go into the laboratory of Prof. Gudden, of Munich. He stated that his experiments had shown him that in cats the visual area in the cortex extended over a large surface and was not limited to such narrow bounds as some had been disposed to believe.

AN ANOMALOUS FORMATION IN THE VITREOUS HUMOR OF EACH EYE.

BY J. S. PROUT, M.D.,
BROOKLYN, N. Y.

MR. F. H. C., aged twenty-six, a medical student, who consulted me recently, described his condition as follows: "About two years ago I noticed a peculiar line-like object in each eye, resembling a flexible cord attached above and below, which played across the eye with a snake-like motion with the movements of the ball, and which appeared most plainly when looking steadily at a bright object. It has continued unchanged since first seen. It seems to be semi-transparent, with a fringe-like border, does not cause any inconvenience and is only seen when my attention is called to it. The flame of a lamp or of an ordinary gas-jet when seen at the distance of about one hundred feet with the right eye appears as a bright circle with a central round dark spot, while with the left eye the same object appears as a bright circle with a small dark ring at the centre. In each case the circle is to the left side of and touches the flame. It causes no inconvenience." He further says that his eyes have never been inflamed, painful or injured in any way. They are entirely normal in external appearance. He has no asthenopic symptoms.

O. D. $-\frac{1}{6}\bigcirc -\frac{1}{8}$ cyl. axis 20°, V. $= \frac{1}{3}$.
O. S. $-\frac{1}{6}\bigcirc -\frac{1}{8}$ cyl. axis 90°, V. $= \frac{1}{3}$.

In looking into each eye with the ophthalmoscope from a distance of about twelve inches, a long dark object is seen floating in the vitreous, in a nearly vertical direction, rather to the outer side of the visual line, which, on closer examination, has the appearance of a fibrous cord, as shown in Fig. 1, a copy of a very exact water-color picture of the right eye by C. H. May, M.D., of New York city. It seems to start below from a semi-atrophic spot in the choroid, to pass upward, arching forward, toward or to a larger atrophic spot in the choroid. The fundus of the eye is seen with — 8 D.; at its lowest point this body is seen — 3 D., then with — 8 D., a little further up with + 5 D., then with + 10 D., giving off filaments that are seen with + 15 D., then it sinks at the upper spot to + 2.50 D., and to 0. These measurements, which were made with extreme care by Dr. May, are indicated on the drawing. In Fig. 2, of the left eye, the picture was unavoidably made from memory, and is merely intended to show that the body is very similar to that in the right eye in appearance and position, though in this eye there is only one atrophic spot, which is nearer the posterior pole of the eye than it appears in the picture.

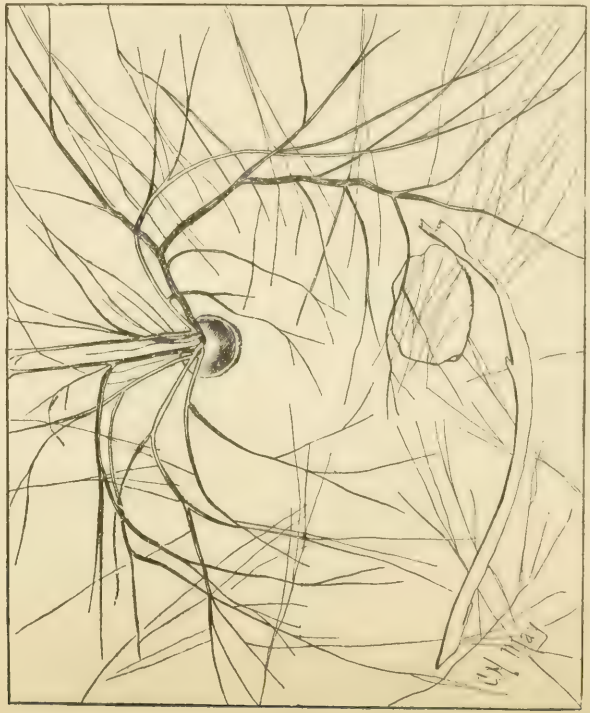
In each eye this structure looks like a bundle or cord of connective tissue from which filaments are given off, and which, towards the ends, in places looks like an untwisted or whipped-out string. When the light falls directly upon it it glistens like a cord of white silk or gives a frosted-silver reflex; when seen by illumination from the background of the eye it is more or less dark. In the right eye there are two small pigmented spots, not copied in Fig. 1, which do not seem to have any relation to the general condition of the eye.

Beyond the points noted there are no special changes visible. There is nothing noteworthy in the nerve-discs, except the arrangement of the vessels and a slight tendency to posterior staphyloma.

By taking the length of the normal eye to be 22.231 mm. (Loring, Text Book of Ophthalmoscopy), of the myopic eye of — 8 D. to be 25.031 mm., or 2.80 mm. too long, of the hypermetropic eye of 10 D. to be 19.781 mm., or 2.45 mm. too short,

Fig. I.

Fig. II.



of the hypermetropic eye of 15 D. to be 18.851 mm., or 3.38 mm. too short, we can locate this anomalous body in its course through the vitreous and know that when it is seen with + 10 D. it is 5.25 mm., a little more than one fifth of the axis of the eyeball, in front of the retina, while the parts at + 15 D. are 6.18 mm., or more than one fourth of the length of the ball, from its posterior pole.

From the facts that the condition is so nearly symmetrical in each eye, and that there is no history or evidence of any pathological process in either eye, I assume that this structure is a congenital anomaly—possibly a remnant of the fœtal circulation of the vitreous—possibly of tissue that occupied the ocular fissure before its closure, although it has now no connection with the nerve-disc nor any apparent relation with the former hyaloid artery.[1] I cannot think it a pathological formation.

I have found no description of anything similar in any book that I have been able to consult.[2]

DISCUSSION.

DR. HARLAN.—Only a few months ago I examined a case of which this picture reminds me. In the left eye, the origin of the formation seemed to be at the optic disc, and it then came forward as this does. In the midst of it, visible only at some points, was a blood-bearing artery. If this originated nearer the disc and contained that little vessel, it would answer for a picture of what I saw. The other eye was normal.

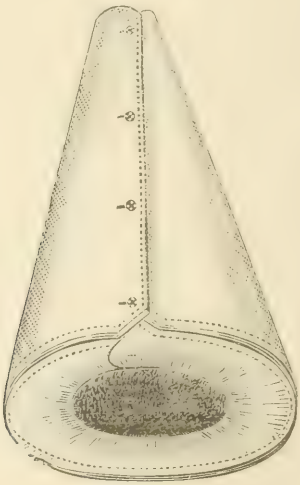
[1] Graefe-Saemisch, II. p. 11.

[2] Dimmer, Archives of Ophthalmology, Vol. xiv. 1, p. 72, gives three "cases of congenital anomalies of the eye," in which there were formations in the vitreous, which were supposed to be "remains of the embryonic connective tissue developing into the vitreous humor, in the ocular fissure, which has never fully closed," p. 80.

SPONGE COVER FOR ETHER INHALATION.

BY RUSSELL MURDOCH, M.D.,
BALTIMORE.

THIS cover is made of white rubber cloth, and when buttoned forms a cone, open at both ends.



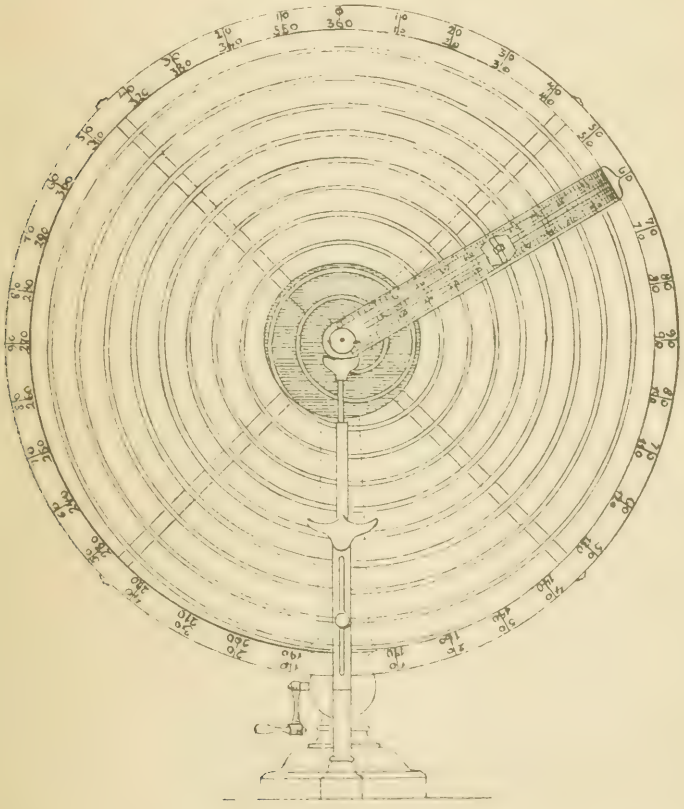
The opening at the apex can be compressed to any desired extent. The closed portion of the base interposes a dry surface between the wet sponge and the face, while the central opening confines the escape of vapor to a restricted region around the nose and mouth. The deep gutter, formed by the base and sides of the cone, will retain any surplus ether.

The cover can be had of Wilms & Co., Baltimore, and John Rynders, New York.

DYER'S PERIMETER.

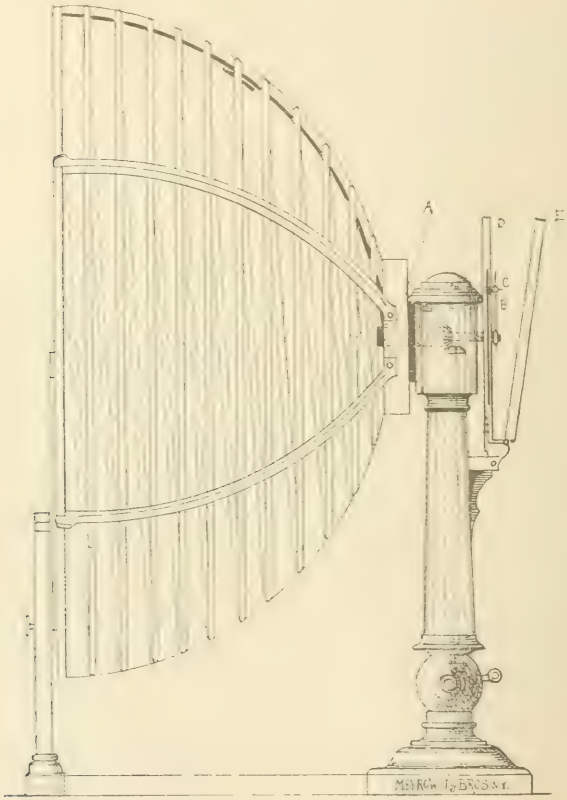
BY WILLIAM S. DENNETT, M.D.,
NEW YORK.

I AM sorry that Dr. Dyer's absence deprives us of a carefully prepared paper on this interesting instrument. But I have with me a drawing of it as "revised and improved," and as



Dr. Dyer entrusted me with the details of certain changes which have been made, I should like very briefly to refer to

them as seen in this drawing, that shows that it has passed from the hands of a carpenter into those of a professional instrument-maker. It is firmly supported by an iron pillar, at the base of which is a crank so placed as to be conveniently reached by either patient or surgeon. The degrees also are marked on both sides of the arm and the periphery, so as to



be read from any position. The "movement" of the instrument is inside the pillar, and the spindle A which carries the arm also moves a registering apparatus on the back. The registering apparatus consists of an arm B, to which is attached a pencil point C. This point is guided by a groove in the back-board D, which is of course a plane spiral, having

the same number of turns as the three-dimentioned spiral which guides the white spot on the arm of the instrument. The chart is attached to the shelf E and can be pressed at will against the pencil point when passing over a scotoma.

The perimeter may be obtained of Meyrowitz Bros., New York; price $50.

LENS SERIES FOR THE REFRACTION OPHTHALMOSCOPE.

BY EDWARD JACKSON, M.D.,
PHILADELPHIA.

IN choosing the lens series for a refraction ophthalmoscope, we have to consider its completeness, and the convenience with which it may be used. To a certain extent these are inversely proportional; and in any series of much practical value, it is only possible to secure certain important advantages by sacrificing other advantages of less importance. Just how and where the sacrifice shall be made is largely a matter of individual taste; still that taste is to be exercised within certain limits. One of these limits is set by the minimum of inaccuracy in the correction that causes a perceptible blurring of the fundus image. This minimum may be placed at about 0.5 D., so that this is the smallest interval between the successive lenses of the series that conduces to certainty and exactness. To have the lenses varying by a smaller interval than this, rather favors inaccuracy and confusion. Again, with strong lenses, a slight difference in its distance from the observed eye makes a considerable difference in the degree of ametropia which the lens will correct. For a lens of over 6. D., one-half inch of difference in distance means more than 0.5 D. difference of power to correct ametropia. Hence, above 6. D., intervals so small as 0.5 D. are useless. For the same reason it is not desirable to have a 1. D. interval above 10. D.

A third limit is fixed by the degrees of ametropia likely to be met with. This will be at the uttermost, taking the extreme cases, for convex, 20. D., for concave, 50. D.; while lenses above 12. D. convex and 25. D. concave will be very rarely useful.

I should regard a series composed of the following lenses as one of ideal completeness:

Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 4.5, 5., 5.5, 6., 7., 8., 9., 10., 12., 15., 20. D.

Concave 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 4.5, 5., 5.5, 6., 7., 8., 9., 10., 12., 15., 20., 30., 50. D.

In sacrificing completeness, to gain other advantages, it is to be remembered that the strongest convexes and concaves of the above series are of the least value; and next, the 4.5, 5.5 and 9. D., especially the 9. in the convex and the 4.5 and 5.5 in the concave. It is, throughout, much less important to have 0.5 D. intervals in the concave series, because in myopia we have other ways of determining exactly the degree; while for latent hypermetropia nothing can replace the refraction ophthalmoscope.

With regard to the convenience of a given series, it is to be remembered, that the weak convex lenses are most frequently used; and next, the weak concaves, and convexes of medium power. Then it is convenient to be able, without taking the instrument from the eye, and with a single movement of the finger, to substitute for each lens, either the next above it or the next below it in the series. This is, however, only to be obtained by having a separate lens for each power in the series, and mounting them all in a single disk or slide. But it is also convenient, in dealing with the higher degrees of ametropia, to go at once to the approximate correction, without being compelled to go over all the weaker lenses first. That is, to have a sort of coarse adjustment, by which about the proper glass may be arrived at quickly; while a more accurate result may be arrived at by the subsequent use of a sort of fine adjustment. And this is only attainable by some arrangement, for combining two or more lenses, mounted in different disks or slides. Combination also renders it possible to get a full series from a few lenses, giving us smaller and lighter instruments.

The special series to which I wish to call attention have been adapted to the form of ophthalmoscope which I described in our *Transactions* last year (p. 111); but they could be used equally well in other forms of instruments. They are as follows:

Five lenses in each slide or disk.

A. First slide + 1., 2., 3., 4., 5.; second — 0.5, 6., 12., 18. and + 6. This is the series mentioned last year.

B. First slide + 1., 2., 3., 4. and — 22.; second — 0.5, 5., 10. and + 5., 10. Giving, Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 5., 6., 7., 8., 9., 10., 11., 12., 13., 14.; Concave 0.5, 1., 2., 3., 4., 5., 6., 7., 8., 9., 10., 12., 17., 22., 27., 32.

C. First slide + 0.5, 1., 2., 3. and — 18.; second — 0.5, 4., 8. and + 4., 8. Giving, Convex 0.5, 1., 1.5, 2, 2.5, 3., 4., 5., 6., 7., 8., 9., 10., 11.; Concave 0.5, 1., 2., 3., 4., 5., 6., 7., 8., 10., 14., 18., 22., 26.

D. First slide + 1., 2., 3., 4., 13.; second — 0.5, 3., 6., 8., 23. Giving, Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 5., 7., 10., 13.; Concave 0.5, 1., 2., 3., 4., 5., 6., 7., 8., 10., 19., 23.

Six lenses in each slide or disk.

H. First + 1., 2., 3., 4., 5., 6.; second — 0.5, 6.5, 7., 14., 21. and + 7. Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 4.5, 5., 5.5, 6., 7., 8., 9., 10., 11., 12., 13.; Concave 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 4.5, 5., 5.5, 6., 6.5, 7., 8., 9., 10., 11., 12., 13., 14., 15., 16., 17., 18., 19., 20., 21.

I. First + 1., 2., 3., 4., 5. and — 27.; second — 0.5, 3.5, 6., 12. and + 6., 12. Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 4.5, 5., 6., 7., 8., 9., 10., 11., 12., 13., 14., 15., 16., 17.; Concave 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 5., 6., 7., 8., 9., 10., 11., 12., 15., 21., 27., 33., 39.

J. First + 1., 2., 3., 4., 5., 17.; second — 0.5, 3.5, 6., 9., 11., 31. Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 4.5, 5., 6., 8., 11., 14.5, 17.; Concave 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 5., 6., 7., 8., 9., 10., 11., 14., 26., 31.

K. First + 0.5, 1., 2., 3., 4., 14.; second — 0.5, 2., 5., 7., 9., 26. Convex 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 5., 7., 9., 12., 14.; Concave 0.5, 1., 1.5, 2., 2.5, 3., 3.5, 4., 5., 6., 7., 8., 9., 12., 22., 29.

L. First + 0.5, 1., 2., 3., 7., 11.; second — 0.5, 1., 2., 3., 7., 20. Convex 0.5, 1., 1.5, 2., 2.5, 3., 4., 5., 6., 7., 8., 9., 10., 11.; Concave 0.5, 1., 1.5, 2., 2.5, 3., 4., 5., 6., 7., 9., 13., 17., 20.

Of the above series, D and J, and within a more limited range L, are particularly notable for the convenience with which they may be used.

ALBUMINURIA OF PREGNANCY. RETINITIS. INDUCED PREMATURE DELIVERY.

By S. D. RISLEY, M.D.,
PHILADELPHIA.

Mrs. ———, aged thirty-five, consulted me in September, 1884, because of rapidly failing vision. She was pallid and very feeble, having quitted her bed in order to make the visit to the city. She was brought by her husband, a capable physician of large experience, who related that she was pregnant between the fourth and fifth months; that she had from the first suffered very much from morning sickness, and later from violent morning headache, with which she awoke. The pain was chiefly frontal, and subsided toward midday. Its duration steadily increased, however, until it became quite constant and more and more severe, at last confining her to her room and much of the time to her bed.

Within the preceding week these symptoms, especially the headache, had very much ameliorated, but with the diminished pain began the failing vision, which rapidly progressed, until in O. D., V. = counts fingers at two feet, eccentric fixation. O. S., V. = $\frac{10}{200}$. The ophthalmoscope revealed the usual appearances of pronounced albuminuric retinitis.

In O. D. macula = Em., while the most prominent part of the nerve = + 3.5 D. There was marked infiltration of the retina, giving a snow-bank appearance around the nerve and extending far into the periphery of the eye-ground. The nerve margins, and in many places the retinal vessels, were quite

hidden by the swollen and opaque retina. There were numerous linear hæmorrhages scattered throughout the eye-ground.

In O. S. there were no hæmorrhages and the swelling was not so great, but the retinal infiltration was very marked, and the nerve margins could be seen with + 2. D. The gray-white appearance extended as far anteriorly as the ophthalmoscopic picture; the veins were tortuous, and both arteries and veins were lost in many places in the opaque retina. A specimen of urine, immediately procured, became an almost solid mass on boiling, and after two days showed only $\frac{2}{10}$ of supernatant fluid.[1]

The very serious nature of her accident was apparent. There was still more than *four* months before her gestation would naturally terminate. Long before its completion, however, she would be hopelessly blind. If even her life were spared to the full time, she would then be exposed to the serious accidents which hang like a pall over the child-bed of the albuminuric woman.

Having in view this outlook, full of foreboding, I suggested to her husband the advisability of induced labor, but asked for counsel. Later in the day Dr. William Goodell, of Philadelphia, in consultation with the patient's husband and myself, also advised abortion. This advice was given to the patient, who very promptly refused on moral grounds to accept it; and every argument failed to shake her determination.

It was then suggested that she return to her home, lay the matter before her clergyman, and be governed by his advice.

The subsequent history is well told in the following letters from her husband:

Oct. 5th, 1884.

My Dear Doctor:—Owing to my great distress of mind I have failed to write you earlier of my wife's condition. Soon after our return home, Mrs. ———'s clergyman saw her; but it was only after a great deal of argument on his part that she was convinced of her duty as to accepting the means offered for her relief. She finally acquiesced, and on the Saturday

[1] The patient had had albuminuria in a former pregnancy, which had terminated normally in all respects. The albuminuria had disappeared after parturition, and did not reappear during a subsequent pregnancy.

following our visit to you I introduced the first sponge-tent, which was followed by three others, when on Tuesday morning she began labor, and was delivered of a living fœtus at about the fifth month. She at once went into an unconscious condition, without convulsions. The urine was then about 25% albumen, and contained hyaline and epithelial casts containing granular matter. Sp. gr. 1.010. She remained in this condition until Friday evening, when there were gleams of intelligence, but evidences of right hemiplegia, with consequent aphasia, which remains complete, whilst intelligence is growing brighter * * * * The albumen has gradually diminished, until now there is a mere trace. The granular matter and casts cannot be found. The quantity of urine voided rather above the normal than below it. * * * *

Yours, &c. ————————.

On November 1st, he writes again, as follows:—

MY DEAR DOCTOR:— * * * * There are still traces of albumen in the urine, but the microscope reveals nothing to indicate serious lesion in the kidneys. I am trusting to the time when complete involution of the womb shall have been established, for the removal of all traces of impaired function in that organ. The aphasia still exists. There are times when from sudden impulse or quickened emotion, she may utter a complete and intelligible sentence, bearing with it complete sense of her meaning, but when she is asked to repeat it or any part of it she utterly fails. Her intelligence is quick, and she comprehends all that is said to her or done for her, and thoroughly appreciates her condition. Frequently, when by all the effort she can command she fails to make her nurse or physician understand her, she gives vent to an expression of disappointment or despair, as Oh Mercy! Oh My!—words which never seem to fail her. She can sing any air in perfect time with which she may be acquainted, and always the air which may be called for. The *retinal* trouble has certainly very much improved, * * * * as shown by her improved vision. I had Dr. Rohrer of our city examine her eyes last week. He still finds exudation spots on the retina of both eyes, and in the region of the macula in the right eye very considerable. Her diet has been milk exclusively until within the past few days, when she was permitted to have several roasted oysters with the gills and muscular portions taken out. She has taken the Buffalo Lithia-water with much benefit, and until recently the strychnia-mixture with Basham's and mild aperients. I trust that the cerebral defect may

pass away by solution of what is evidently an embolism, or by the establishment of collateral circulation, without leaving disorganization.

Yours, &c. ————————.

The following year, about six months from the date of the last letter, I was greatly and very pleasantly surprised by Mrs. ——— walking into my consulting-room, apparently in perfect health. In O. D., V. = $\frac{20}{30}$, O. S., V. = $\frac{20}{20}$. There were a few splotches in the right eye-ground, while in O. S. all traces of the disease had disappeared. The aphasia had so far disappeared that she held her own in the conversation with little difficulty, and called the letters on the test-card correctly without hesitating.

ABSENCE OF THE OPTIC CHIASM AND OTHER CEREBRAL COMMISSURES; TEMPORAL HEMIANOPIA.

BY W. S. LITTLE, M.D.,
PHILADELPHIA.

DR. A. W. WILMARTH, assistant physician and pathologist to the Pennsylvania Institution for Feeble Minded Children, at Elwyn, Penn., made a post-mortem examination upon a male child, who died quite recently, from chronic meningitis with effusion, finding certain variations in the cerebral substance and absence of several commissural parts, among them being the optic chiasm. No ophthalmoscopic examination of the eyes had been made. The visual fields had been studied as exactly, as the low order of intellect of the patient enabled Dr. Wilmarth to accomplish it. Through the courtesy of Dr. I. N. Kerlin, superintendent of the Institution, I am enabled to present a photograph of the base of the brain, taken by Dr. Wilmarth, along with the notes of the eye symptoms and general condition as reported by him.

D. M., male, aged ten. Epileptic. Mute. Idiot. Alter-

nating divergent strabismus existed. Temporal hemianopia was ascertained to be present, by covering one eye and snapping with the fingers in front of the other eye, finding the point where the lids would close, to escape the threatened blow; this was repeated several times to avoid error, and the line of blindness extended from the outer side, to the vertical median line for each eye, the nasal half of each retina being involved. The commissures of this brain showed a singular lack of development. The corpus callosum ended posteriorly just in front of the pineal gland, leaving this body and the tubercula quadrigemina exposed. The middle and posterior commissures were entirely wanting. The anterior commissure was normal in size and appearance. There was no optic commissure;

a small projection was found on the inner side of each nerve, where it should have been, but they did not touch by at least one quarter of an inch. No lesion was found in the occipital lobe or in the course of the fibres in the optic tract to explain the peculiarity of vision. The left hemisphere was smaller than the right, and the opposite side of the body was paralyzed, and less nourished than the other. The rarity[1] of the cerebral

[1] Vesal, 1555 (G. H. Meyer), in Arch. für Anatomie von Du Bois-Reymond und Reichert (1870), p. 523 (Holzschnitt).
Prochaska—Klein—Nicholaus de Janaua (J. F. Meckel), Handb. d path. Anat. I. Bd., p. [illegible].
Graefe und Sæmisch, II. Cap. VI. p. 100. Manz.

condition, especially absence of the optic chiasm with temporal hemianopia, makes the specimen valuable. The existence of temporal hemianopia in this case is instructive, as pressure on the chiasm, either by a tumor or from effusion, gives the same symptoms in the visual field; but in this case, the temporal hemianopia was recognized fully a year before symptoms of compression came on, after which, death ensued in three to four weeks. The fluid within the cranial cavity was estimated at three ounces. That there was no compression in the earlier stages of the meningitis, which was chronic, is impossible to say, but it is doubtful.

A longitudinal section of one optic nerve and a cross section of the other, is to be made at the point where an attempt at forming the chiasm exists; a description of the microscopical appearances of the fibres of the optic nerves will be submitted to the Society at another time.

SOME REMARKS ON ASTHENOPIA AND THE CHANGES IN REFRACTION IN ADOLESCENT AND ADULT EYES.

By WILLIAM F. NORRIS, M.D.,
PHILADELPHIA, PA.

In taking up for discussion a subject so well worn and threadbare, I must ask the indulgence of the Society, if in an attempt to emphasize what appear to me important convictions, I repeat to some extent facts and statements with which we are all familiar. I shall, however, be brief, and hope thus to avoid producing in your minds impressions similar to the mental shudder which comes over us when after a long morning's work we face "another refraction case," or to the sigh of relief with which we at last jot down the correction ordered for our patient. Let us consider for a moment the normal growth of the eyeball, how, starting in the new-born child with an average visual axis of 17.5342 mm., we find in the

average adult eye, not much used for near work, an average axis of 24.3037 mm.[1]

NOTE.—As is well known Listing has assumed for the average emmetropic eye a visual axis of 22.647 mm., while Helmholtz, at first assuming an axis of 22.231, has later adopted 22.834 as the standard. These measurements are from the anterior pole of the eye (outer surface of the cornea) to the fovea centralis. Allowing (with Donders) 1.3 mm. for the thickness of the sclerotic, we obtain in the first case 23.947 mm., in the latter 24.134 mm. as the diameter of the eyeball in its visual axis. Arlt[2] considers an eye with a corneal radius of 7.6 mm. and an axis of 24 mm. as emmetropic, and anything over 26 mm. as certainly myopic. Mauthner,[3] after a careful discussion of the subject, assumes considerable variation in the axis of emmetropic eyes, which may either have a sharply curved cornea with correspondingly shorter diameter of the eyeball, or a less curved cornea with greater diameter of eyeball. As extremes, he states that we may have an emmetropic eye with a corneal radius of 6.95 mm. and a visual axis of 20.95 mm., or a corneal radius of 8.04 mm. with an axis of 24.94 mm. These measurements are from the outside of the cornea to the fovea, and if we add 1.3 mm. for the thickness of the sclerotic we obtain 22.25 mm. as the diameter of the smaller eyeball, and 26.24 mm. as that of the larger eyeball. The same author reckons the axis of various grades of hypermetropia as follows (Ibid. p. 642):

H = $\frac{1}{40}$,	Corneal Radius	7.77,	diameter in visual axis	24.70.
H = $\frac{1}{12}$	..	..	7.62,	..	..	..	23.67.
H = $\frac{1}{6}$	..	..	7.48,	..	..	..	22.56.
H = $\frac{1}{4.5}$	..	..	7.43.	..	..	..	21.85.

If the eye remained only partially developed it would, even with an hypermetropia of $\frac{1}{4.5}$, have increased to 20.55 mm., while a hypermetropia of $\frac{1}{12}$ would correspond to an axis of 22.30 mm., and a hypermetropia of $\frac{1}{40}$ would give us an axis of 23.40 mm. Thus, even for the very highest grades of hypermetropia, the eye would have grown 3 mm., while to reach emmetropia it must have increased at least 6.5 mm. in its visual axis. When we look at the soft, elastic, bluish sclerotic of the young, we can readily appreciate, how under any softening influence it would give way slowly, even to normal intraocular pressure. Transient congestion is the universal law of physio-

[1] Jaeger, Einstellungen des dioptrischen Apparats. Wien, 1861, p. 14.
[2] Ueber die Ursachen und Entstehung der Kurzsichtigkeit, p. 2. Wien, 1876.
[3] Mauthner, Über die optischen Fehler des Auges, p. 423. Wien, 1870.

logical activity; if we use our muscles more blood circulates in them, and for the time they become tense and swollen. If we irritate the stomach by food, it becomes red; and if we converge and accommodate with our eyes, more blood flows to them, the vast choroidal vascular network, as well as the ciliary processes and ciliary muscle, occupy more space and transiently raise the intraocular tension, while the sclerotic also carries more blood, and its lymph spaces, as well as those of the cornea, become fuller of serum. The retina shares in the general excitement; it becomes swollen and less transparent, and presents a faint pinkish hue in its thicker parts, it vails but does not entirely hide the upper and lower margins of the disc. The walls of the larger blood-vessels at or near their emergence from the disc become visible, and numerous yellowish or silvery reflexes may be seen in various parts of the eye-ground, near the smaller vessels, and are probably due either to a similar cause, or to an alteration of their lymph sheaths. We have in short a state which has been so well described and pictured by Jaeger as retinal irritation. (*Netzhaut Reizung.*)

In healthy individuals where there are sufficient intervals of rest, the blood-vessels contract, the increased exudation of serum is absorbed, and the eye once more subsides into a state of quiescence. If, however, the period of work be too long prolonged or too often repeated, the capillaries remain dilated, the lymph spaces fuller, and there is never a period of complete contraction and quiet. The reflex actions which determine a normal flow of blood to the organ become disturbed, and we have a congestion of the eyelids and of the tarsal and bulbar conjunctiva, accompanied by an itching, burning, and watering of the eye, with a feeling of sandiness or sleepiness. Whenever the exertion is continued and pushed still further, the weary muscles ache, and we have pain in and back of the eye, and also shoots through the temple and forehead. Frequent repetitions of this process cause the congested, softened, and serum-infiltrated tissues to give way even under the *normal* intraocular pressure. This yielding usually takes place at the posterior pole, where the sclerotic is best supplied with blood, but

where it is at the same time most weakened by the numerous perforations in its coats, due to the entrance of the posterior ciliary arteries and nerves.

Any constitutional dyscrasia which makes the circulation sluggish and the tisses less tense and resisting—notably those morbid processes which are usually grouped under the name of scrofula—greatly augments this tendency to change, as does also the constitutional feebleness ensuing after eruptive and continued fevers. Any inflammation of the choroid may also cause softening and cause the eye to give way to its normal intraocular pressure on the slightest attempt at near work, thus producing the myopia which we not unfrequently see among unlettered people. Although not usually classed with myopia, I cannot but regard conical cornea and its cogeners, the high grades of mixed astigmatism, as usually examples of similar congestive softenings, affecting the anterior parts of the eye; although they may have had their starting point in strumous or other local lesions. These defects, like true myopia, are increased by persistent attempts at near work. With this summary of my views as regards the congestive softenings of the eyeball, the diminution of hypermetropia and its passage into myopia, we may now study a little more minutely the asthenopic symptoms which accompany these changes.

The low grades of congestion of the tarsal and ocular conjunctiva cause the eye to feel sandy and the lids heavy, while the individual becomes drowsy and perhaps falls to sleep promptly over his book. When eye-work is persisted in after this point, we have blurring of the print, and burning and itching of the eyes. If work still be persisted in, neuralgic pain develops, and is felt in the eye itself, but is usually more marked in the forehead and temple, while in some cases there are shoots of pain back to the junction of the head and neck. If such eyes are examined with the ophthalmoscope ample evidence is obtained that there is a congestion of the retina and of the intraocular end of the optic nerve, as well as of the conjunctiva and lids.

We find the retinal fibres around the disk infiltrated and swollen, causing its pink to be more or less mixed with gray.

The outlines of the nerve are clouded, and at times invisible, especially in the neighborhood of the larger vessels. The swelling is often sufficient to cause the disc to become prominent, while the choroid shows the disturbance of its circulation by an increase in its granular aspect, each cell or perhaps each group of cells (corresponding to a capillary loop), swelling so as to cause a slight elevation of its surface. When this state goes further and the pigment is disturbed in its distribution, the eye-ground looks black-peppered, and honeycombed. In this state of the eye-ground, the walls of the larger vessels change their index of refraction and therefore often become visible on the disc, and to considerable distances from it. The lymph sheaths which accompany and surround the retinal vessels may often also be seen as gray or whitish streaks along the vessels, and as silvery reflexes in a level with them or in front of them.

Almost all cases of myopia will tell you that there was a time when they had considerable neuralgic pain in the forehead, temples and eyes, as well as itching and burning on the prolonged use of the eyes, but that while the latter symptoms still often recur, the neuralgia has disappeared. This is due to the fact that the neuralgia is present so long as the ocular shell is tough and resistant, but usually disappears when it softens and gives way.

In striking contrast to this form of asthenopia is that occurring in medium grades of hypermetropia (*e. g.* from $\frac{1}{8} - 1\frac{1}{8}$), where the sclerotic is dense, thick and unyielding, and where severe neuralgic pain is often the prominent symptom of the asthenopia. The more mobile and weaker the nervous system of the patient, the more severe are the neuralgic pains. The eyes often become so sensitive that any rapid change of focus from distant to near objects is uncomfortable, and is in some cases accompanied by nausea and dizziness. Such eyes usually do not become myopic (although the following table shows a rapidly diminishing hypermetropia of $1\frac{1}{2}$), the severe discomfort consequent upon their use either forcing the patient to to wear a correcting glass, or causing him to limit his work or change his occupation.

Probably, also, the greater thickness of the sclerotic, and the fact first pointed out by Arlt, that owing to the small size of the eyeball it is not possible for the external rectus during convergence to press upon the corresponding vortex vein, and thus augment intraocular congestion, may go far to prevent any lengthening of the visual axis.

Nothing to my mind demonstrates more forcibly the truth of the foregoing remarks than the prompt relief of many cases of long standing and constantly recurring conjunctivitis and blepharitis by the habitual use of correcting glasses. The cases of diminishing hypermetropia of low grade, which become stationary under the use of correcting glasses, and in which eyes previously asthenopic become able to perform their usual work with comfort, point also in the same direction. Similar cases must have been observed by many of my fellow members; but notwithstanding, how frequently do we hear that it is not worth while to correct low grades of ametropia, and how often do we see that such cases, after extensive courses of nitrate of silver, zinc, alum, douches, etc., find relief in the rest which follows the use of a mydriatic and proper glasses. It is my belief that it is always worth while to correct ametropia, no matter how slight, if it produces asthenopia, and that we thus go far to prevent congestion and softening of the eye and its elongation in the visual axis. There is another large group of cases, where, even with a considerable degree of astigmatism or hypermetropia, glasses fail to cure the neuralgia and discomfort, although even here they frequently alleviate the suffering and materially augment the working powers of the patient.

There are cases where the ametropia occurs in individuals affected with disease or perverted function of other important organs. In the male sex we often find examples in incipient tabes dorsalis or in meningeal irritation, while in women they are very frequently associated with disease of the uterus and ovaries, or with perverted action of these organs, such as frequently occurs during their development in the young or their shrinking in the old. In such cases very slight optical defects are accompanied by severe neuralgia, not only in the

eye, forehead and temple, but also in the top of the head and at the juncture of the head with the neck; at times even shooting down the spine. Such symptoms often come at unusual times, especially on waking in the morning, when the eyes, instead of being refreshed by sleep, are sandy and painful and unable to bear the light. The patients often complain of the lids sticking to the eyeball during sleep, so that on waking during the night, they have difficulty in opening their eyes even after resorting to bathing them in warm water. This is due to perverted sensation, and not to any glueing of the conjunctival surfaces by secretion. Of course all such cases receive only partial relief from glasses, but they nevertheless often derive great comfort from them, and are thus enabled to do a considerable amount of work with less discomfort than they previously suffered. Where the ametropia is but slight, such patients, when their health has been re-established, are often able to lay aside the weak cylinders or convex glasses which have previously afforded them so much comfort. The same ability to lay aside glasses previously necessary is also often seen after convalescence from acute disease, when slight optical defects, which previously passed unnoticed, become unbearable, and where the discomfort gradually vanishes as they regain their health.

To emphasize and maintain these views, I have selected from my case books and hospital records, a few instances, all of which have been carefully studied for years, and all of which have been repeatedly atropinized. To facilitate ready reference and comparison, they have been arranged in two tables, —First, Diminution of Hypermetropia (six cases); second, Passage of Hypermetropia into Myopia (five cases).

ANALYSIS OF SIX CASES OF GRADUAL DIMINUTION OF HYPERMETROPIA.

Each determination of the Refraction in every case having been made after Absolute Paralysis of the Accommodation by the repeated use of Atropine or Hyoscyamine.

No. of Case	Sex	Age	Occupation	Date of first Examination and State of Refraction and Acuity of Vision at that time.	Date of second Examination, and State of Refraction and Acuity of Vision at that time.	Date of third Examination, and State of Refraction and Acuity of Vision at that time.	REMARKS.
1	F	19	Scholar, later College Student.	1874. R. E. $+\frac{1}{18}$ S. V. $=\frac{20}{20}$. L. E. $+\frac{1}{20}$ S. V. $=\frac{20}{20}$.	1876. R. E. $+\frac{1}{21}$ S. ○ $+\frac{1}{18}$ c., axis 75°. V. $=\frac{20}{20}$. L. E. $+\frac{1}{21}$ S. V. $=\frac{20}{20}$.	1881. R. E. $+\frac{1}{18}$ S. — $+\frac{1}{18}$ c., axis 90°. V. $=\frac{20}{20}$. L. E. $+\frac{1}{18}$ S. — $+\frac{1}{18}$ c., axis 90°. V. $=\frac{20}{20}$.	In right eye, in 1874, there was a pigment loop to the outside of the disc, separated from it by a crescent of normal colored choroid, while in 1881 there was a semi-atrophic crescent. In left eye, in 1874, there was a slight brownish crescent to the outside of the disc; while in 1881, there was a semi-atrophic conus with black outer margin, and another pigment loop beyond. Insufficiency of internal. 8°.
2	F	16	Scholar, 6th.	1873. R. E. $+\frac{1}{24}$ S. V. $=\frac{20}{20}$. L. E. $+\frac{1}{20}$ S. V. $=\frac{20}{20}$.	1874, about 11 mos. later. R. E. $+\frac{1}{12}$ c., axis 90°. V. $=\frac{20}{20}$. L. E. $+\frac{1}{60}$ S. ○ $+\frac{1}{60}$ c., axis 90°. V. $=\frac{20}{20}$.		In the interval between the examinations the glasses were not worn constantly, and the patient complained of headache, itching and burning of the eyes and blurring of the print.
3	M	10	Scholar, later College Student.	1872. R. E. $+\frac{1}{12}$ S. V. $=\frac{20}{20}$ ($\frac{20}{15}$?). L. E. $+\frac{1}{12}$ S. V. $=\frac{20}{20}$ ($\frac{20}{15}$?).	1877. R. E. $+\frac{1}{12}$ c., axis 90°. V. $=\frac{20}{20}$. L. E. $+\frac{1}{60}$ S. ○ $+\frac{1}{60}$ c., axis 60°. V. $=\frac{20}{20}$.	1881. R. E. $+\frac{1}{144}$ S. — $+\frac{1}{144}$ c., axis 90°. V. $=\frac{20}{20}$ with difficulty. L. E. $+\frac{1}{144}$ S. — $+\frac{1}{144}$ c., axis 60°. V. $=\frac{20}{20}$ with difficulty.	Pain back of the eyes, congestion of the ocular conjunctivæ and of the margins of the eyelids. At the two earlier dates severe neuralgic pain in temple and forehead. At the latter, no more acute pain. Ophthalmoscope shows great haziness of the retina, and wooliness of the choroid.

4	M	25	Student of Theology, Lake Charles, Iowa.	1874.		1885.	
				R. E.	L. E.	R. E.	L. E.
				$+\frac{1}{36}$ S. V.=$\frac{20}{20}$	$+\frac{1}{42}$ S. V.=$\frac{20}{20}$	$+\frac{1}{72}$ S. $\bigcirc$ $+\frac{1}{72}$ C., axis 80°. V.=$\frac{20}{20}$	$+\frac{1}{42}$ S. $\bigcirc$ $+\frac{1}{42}$ C., axis 90°. V.=$\frac{20}{20}$
							Insufficiency of recti interni.
5	M	39	Czech.	1872.		1886.	
				R. E.	L. E.	R. E.	L. E.
				$+\frac{1}{36}$ S. V.=$\frac{20}{20}$	$+\frac{1}{36}$ S. V.=$\frac{20}{20}$	$+\frac{1}{48}$ C., axis 60°. V.=$\frac{20}{20}$	$+\frac{1}{144}$ S. $=$ $+\frac{1}{144}$ C., axis 30°. V.=$\frac{20}{20}$
							Marked blepharitis and conjunctivitis, with great sensitiveness to artificial light. Grayish nerves.
6	F	14	School girl.	1877.		1884.	
				R. E.	L. E.	R. E.	L. E.
				$+\frac{1}{42}$ S. $+\frac{1}{60}$ C., axis 90°. V.=$\frac{20}{20}$	$+\frac{1}{42}$ S. $+\frac{1}{60}$ C., axis 90°. V.=$\frac{20}{20}$	$+\frac{1}{24}$ S. $=$ $+\frac{1}{60}$ C., axis 90°. V.=$\frac{20}{20}$	$+\frac{1}{48}$ S. $=$ $+\frac{1}{60}$ C., axis 90°. V.=$\frac{20}{20}$
							The astigmatism remaining the same, we have an increase in the refraction of one twenty fourth in the right eye, and of one thirty sixth in the left.

ANALYSIS OF FIVE CASES OF THE PASSAGE OF HYPERMETROPIA INTO MYOPIA,

Each determination of the Refraction having been made after Absolute Paralysis of the Accommodation by the repeated use of Atropine or Hyoscyamine.

No. of Case.	Sex.	Age at 1st Exam'n.	Occupation.	Date of first Examination, and State of Refraction and Acuity of Vision at that time.		Date of second Examination, and State of Refraction and Acuity of Vision at that time.		REMARKS.
				1881.		1886.		
				R. E.	L. E.	R. E.	L. E.	
1	M	11	School Boy.	$+\frac{1}{60}$ s. ⊃ $+\frac{1}{60}$ c., axis 105°. V.=$\frac{20}{20}$.	$+\frac{1}{12}$ s. ⊃ $+\frac{1}{36}$ c., axis 105°. V.=$\frac{20}{20}$.	$-\frac{1}{30}$ s. ⊃ $-\frac{1}{20}$ c., axis 158°. V.=$\frac{20}{20}$.	$-\frac{1}{60}$ c., axis 180°. ⊃ $+\frac{1}{60}$ c., axis 90°. V.=$\frac{20}{20}$.	
				1884.		1883.		
2	F	10	School Girl.	R. E.	L. E.	R. E.	L. E.	Passage of A^b in one eye into $M+A^m$, the degree of A^c remaining unaltered; of A^m in the other to $M+A^m$. Patient a frail child, with hereditary tendency to phthisis.
				$+\frac{1}{60}$ c., axis 180°. V.=$\frac{20}{20}$.	$-\frac{1}{60}$ c., axis 60°. V.=$\frac{20}{20}$.	$\frac{1}{24}$ s. ⊃ $-\frac{1}{60}$ c., axis 30°. V.=$\frac{20}{20}$.	$-\frac{1}{24}$ s. ⊃ $-\frac{1}{48}$ c., axis 90°. V.=$\frac{20}{20}$.	
				1874.		1885.		
3	M	20	Clerk.	R. E.	L. E.	R. E.	L. E.	In right eye, in 1874, there was a slight pigment loop to the outside of the disc, but in 1885 there was a semi-atrophic conus as wide as the largest part of the main retinal vein. In left eye, in 1874, slight absorbing conus with heavy pigment border at the outside. In 1885, an annular conus with faint black sprinkling in places, but the marking of pigment to the outside has entirely disappeared.
				$+\frac{1}{60}$ c., axis 90°. V.=$\frac{20}{20}$.	$+\frac{1}{60}$ c., axis 90°. V.=$\frac{20}{20}$.	$-\frac{1}{48}$ c., axis 180°. V.=$\frac{20}{20}$.	$-\frac{1}{12}$ c., axis 165°. V.=$\frac{20}{20}$.	
				1877.		1882.		
4	M	22	Law Student.	R. E.	L. E.	R. E.	L. E.	We have here an almost regular spheroidal dilatation of the eye—the emmetropic meridian having become slightly myopic, and the hypermetropic meridian having changed to an equal degree in the left eye, thus making it emmetropic.
				$+\frac{1}{48}$ c., axis 90°. V.=$\frac{20}{20}$.	$+\frac{1}{60}$ c., axis 85°. V.=$\frac{20}{20}$.	$-\frac{1}{60}$ c., axis 180°. V.=$\frac{20}{20}$.	$-\frac{1}{60}$ c., axis 150°. V.=$\frac{20}{20}$.	
				1877.		1882.		
5	M	17	College Student.	R. E.	L. E.	R. E.	L. E.	Cases 4 and 5 were brothers—their father highly myopic, their mother with nearly normal vision. The right eye has lost its astigmatism and become myopic in all meridians alike. In the left eye, the amount of astigmatism remains the same, and the meridian of strongest curvature retains the same direction, while the refraction has increased one-sixteenth in all meridians.
				$+\frac{1}{48}$ c., axis 180°. V.=$\frac{20}{20}$.	$+\frac{1}{48}$ c., axis 90°. V.=$\frac{20}{20}$.	$-\frac{1}{20}$ s. V.=$\frac{20}{20}$.	$-\frac{1}{24}$ s. ⊃ $-\frac{1}{48}$ c., axis 180°. V.=$\frac{20}{20}$.	

In conclusion :—

I.—It must be remembered that a diminishing hypermetropia and an increasing myopia are merely arbitrary expressions referring to different stages in a process essentially the same ; in both cases it being simply a slow distension of the softened eyeball in the direction of its visual axis.

II.—I would urge therefore the careful correction of every case of ametropia where there is any accompanying asthenopia ; such correction going far to diminish and prevent the congestive and softening influences which always accompany the use of the eye and facilitate the diminution of hypermetropia and the production of myopia. In my judgment, this is quite as important a preventive of elongation of the visual axis, as any other one measure to which we habitually resort, not excepting the usual precautions as to lighting, hygiene, and health.

III.—All such cases should be carefully measured under a strong mydriatic, as it is impossible to correct them accurately without it, either by the use of test glasses, of the ophthalmoscope, or of retinoscopy. Moreover, the enforced rest of the eye during the influence of the mydriatic, is an important aid in diminishing its congestion.

IV.—We should carefully watch all cases of hypermetropia where the ophthalmoscope shows a decided difference of level between the disc and the macula. They are usually cases of slow distension of the eyeball and diminishing hypermetropia. The same rule holds good in cases of increasing myopia.

V.—During the dilatation of the pupil by the mydriatic, we should insist on our patients wearing dark glasses, even in a moderate light. The immense quantity of light otherwise admitted to the eye is likely to irritate it, and at times may cause a low grade of chorio-retinitis, which it is much easier to call into existence than to cure.

DISCUSSION.

DR. THEOBALD.—It strikes me that there must have been in many of these cases not only a change in the absolute refraction, but an increase of the astigmatism. A change in the strength of the cylinders was required. It will be remembered that last year I reported three cases of what I regarded as progressive astigmatism. In two of these, during a series of years, the astigmatism had apparently doubled in amount. Since I presented these cases, I have had some correspondence with Dr. Randall, who has almost persuaded me that some of them were not genuine instances of increase of the astigmatism, but rather the result of asymetrical action of the ciliary muscle. Under the use of cylinders, the muscle had yielded and allowed more of the astigmatism to come to the surface. This suggests itself in Dr. Norris' cases. If, however, there were such an asymetrical action of the muscle, we should expect that in a myopic patient the relaxation of the ciliary muscle would produce a diminution of the myopia. In the cases reported, the change was in the opposite direction; as the astigmatism increased the myopia developed. I should like to hear Dr. Norris' views in regard to this decided increase of astigmatism.

DR. HARLAN.—No doubt, in nearly all cases, changes in the refraction, particularly spherical changes, are due to changes in the axis of the eye. As has been suggested, there are some which can be referred to changes in the cornea. I recently had the opportunity of examining a patient for whom I prescribed cylindrical glasses several years ago. When examined in 1878, the patient was thirty-one years of age, a theological student. I used a strong solution of atropia, repeated frequently, and assured myself that the ciliary muscle was paralyzed. At that time, under atropia, correction with a + 1.5 D. cylinder in each eye, axis at 90°, gave V. = $\frac{20}{20}$. This answered very well until lately. He now complained of asthenopia, and said that distant vision was not good. I again atropinized the eyes, and found that the low degree of simple hypermetropic astigmatism had changed to mixed astigmatism. In the right eye — 1. D. spherical with + 3. D. cylindrical, gave V. = $\frac{20}{20}$, in the left eye $\frac{20}{15}$. The ophthalmoscope showed nothing abnormal. I am certain that there was no action of the ciliary muscle at the time of either examination.

DR. GRUENING.—I was specially interested in one class of cases which Dr. Norris mentioned. The patient arises in the morning with a pain in the eyes; at times he complains of his eyes being sandy; after an hour or two the eyes feel better.

There is also some photophobia. Such patients are not able to fix an object for any length of time, and often have lachrymation. This peculiar class of cases can not be corrected with glasses. I have described these cases in a paper on reflex ocular symptoms in nasal disease. Looking into the nose, I find evidence of nasal disease. The nasal reflex plays an important part in our modern pathology. All affections depending upon nasal reflex are increased by the recumbent posture, as this favors congestion of the erectile tissue. I find that these patients are better when they are up and about.

If eyes which have rested all night manifest painful sensations in the morning, we may exclude ordinary asthenopia. I found in these cases considerable swelling of the lower borders of the turbinated bones. This was treated by ordinary anti-catarrhal remedies or by the actual cautery, and, in some cases, the diseased tissue was removed with the snare. In other cases there was stenosis, due to cartilaginous excrescences, which were removed. Of a series of two hundred cases thus treated, I have certainly benefited one hundred and fifty. The remaining fifty disappeared, because they were so much startled by the treatment proposed.

Dr. Risley.—It is probably true that certain eye troubles, as described by Dr. Gruening, may be set up by pathological states in the nasal passages, but I am sure that nasal troubles do not account for the slowly distending eye-balls to which Dr. Norris has referred in his paper. I became much interested in the early history of myopia and myopic astigmatism during an examination of the eyes of the school children in Philadelphia, which I made in 1878–81. Prior to the commencement of that work I suspected, and during its progress was convinced, that the myopic eyes were not recruited from the emmetropic eyes, but from those presenting hypermetropic refraction and principally hypermetropic astigmatism. This opinion, advanced in the report of that work, published in 1881, was based upon, first, a group of cases in which hypermetropic refraction had been seen to pass into myopic refraction, and second, upon the fact that the eyes with hypermetropic astigmatism presented a greater percentage of the same pathological appearances, which in their later stages were confessedly characteristic of progressive myopia, viz., choroiditis and posterior staphylomata. Since the publication of the school report, two additional groups of cases—in which *hypermetropic* astigmatism had been observed to pass over into *myopic* astigmatism—have been brought forward, as corroborating the claims set forth in the report of the school work. As the

subject has been studied under a steadily widening experience, I have been more and more thoroughly convinced of the correctness of the views which Dr. Norris has expressed in his paper, that disturbance of the nutrition of the eye-ball, consequent upon the eye strain in hypermetropic refraction, leads to its softening, and thus permits its distension under the strain of protracted near work.

I was much impressed by his remark referring to the anterior distension, making conical cornea and posterior staphyloma dependent upon the same condition, an opinion which I have long entertained. As illustrating this view, I will refer to a case already published in the second group of cases of changed refraction. A young woman, first seen in 1874, suffering from asthenopia, after prolonged use of atropia selected a convex sphero-cylindrical glass for each eye. During the subsequent years marked change in the refraction of both eyes occurred, without the usual changes in the region of the optic nerves. At the present time the hypermetropia has disappeared in the left eye, leaving a low grade of myopic astigmatism. In the right eye, during the depression following the protracted nursing of her invalid mother, the vision sunk to $\frac{1}{20}$, consequent upon conicity of the cornea. She at the same time complained of her severe and constant headache. Under the continued use of mydriatics alternating with eserine and a pressure bandage, the curvatures of the cornea became more regular, and finally it became possible to correct them. A + 1. spherical with a — 5. cylinder, axis at 100°, gave V. = $\frac{20}{50}$. There was no further trouble until two weeks ago, when she came to the office with the eye paining her again. The glass had been broken and had been put in with the axis ten degrees out of the proper plane. After the use of homatropine for several days, she selected the same glass, and it gave the same vision. This case bears out the view expressed. An eye-ball which had been slowly distending, suddenly, from the general softening of the tissues due to depressed health, rapidly distended in an anterior direction. It has fallen to my lot a number of times to watch cases of progressive near-sight, in which the characteristic changes were not seen around the optic nerve, but in which the anterior perforating vessels were dilated and the scleral region obviously thin, and the myopia increasing. In a large number of cases of myopia the distension may be more or less regular anteriorly. I am convinced that certain cases of conical cornea are analogous to posterior staphyloma in progressive myopia.

Dr. Randall.—Of the many wide questions as to the causation of myopia suggested by the paper just read, there is one which I would like to bring to the attention of the Society, in hope that evidence positive or negative can be given by members that will aid in its solution. The proposition is best set forward and in the least equivocal form by Stilling, in the Archives of Ophthalmology, who considers all cases in one of three classes. First, myopia due to excessive corneal curvature, or a physiological myopia which is the adaptation of the eye to its environment—a growth which is a form of evolution, and is a purely physiological adaptation. Beyond this he places a class due to strain and overwork; and adds further a category of excessively high grades of what he calls pernicious myopia, where the eye, from serious choroidal change, assumes a high degree of myopia. I have been struck by the assumption by some other authors of the great importance of this matter of physiological growth in the causation of myopia. In the cases which I have studied, there has seemed a distinct pathological increase in the axis of the eye, accompanied by pathological changes such as choroidal disturbance, and by asthenopia. I would ask what ground is there for an assumption like that made by Dor,[1] when he states that we can recognize in the cradle the eye which is physiologically myopic, although the false science of modern times would call it emmetropic or hypermetropic, because at present rays of light are not focused in front of the retina?

Dr. Norris.—I would say with reference to the remarks of Dr. Theobald, that I have purposely sorted out the cases which could in any way be attributed to corneal change, and have included those which I believe are due to axial change. I have a number of cases of change in the anterior part of the eye, cases of mixed astigmatism changing their refraction, due to congestive softening of the anterior part of the eye. I have not considered these to-night, but have contented myself with the cases which I have given, in which there was no change in the anterior part of the eye, but which appeared to be due to distention of the eye-ball in the macular region.

Only two of the cases show any considerable increase in the amount of astigmatism; in the others there appears to have been a spheroidal increase in the diameter of the eye-ball. To take in all these questions would require a large amount of time, and I do not know that I have thoroughly worked them out. I am rather disposed to think that astigmatism is usually

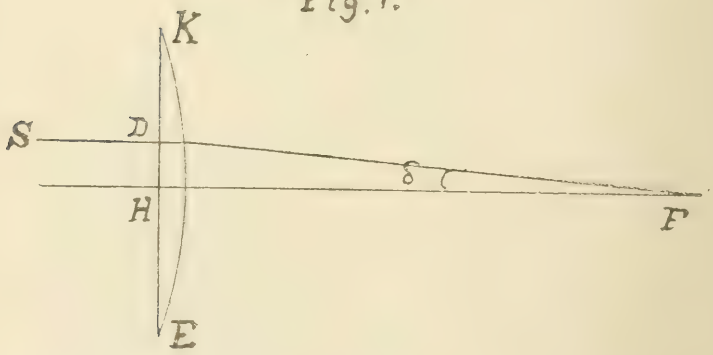
[1] "Etude sur l'Hygiène Oculaire au Lycée de Lyon," p. 12. Paris, 1874.

due to some change in the curvature of the cornea or of the lens, and can only regret that I have no ophthalmometric measurements of these cases. They show, for instance, that hypermetropic astigmatism starting at $\frac{1}{48}$ will pass over to myopic astigmatism of equal amount in ten years. In one or two of the cases, I am quite sure from the amount of choroidal change that the change of refraction must have been due to distention of the posterior part of the globe.

ON THE COMBINATION OF TWO CYLINDRICAL LENSES.[1]

By G. HAY, M.D.,
BOSTON.

Fig. 1.



LET K E, Fig. 1, represent a section of a thin plano-cyl. lens made by a plane perpendicular to the cylinder-axis, the lines of the diagram being supposed to lie in the plane of the section.

H F is perpendicular to K E at its middle point H.

H F $= f =$ principal focal distance (neglecting thickness of lens).

[1] The writer is indebted for the essential part of this paper to Prof. Oliver, of Cornell University, who about sixteen years ago, in response to some inquiries, was kind enough to send him a communication on the subject.

S D is a ray parallel to H F and is deflected by the ang. δ.

H D $= d =$ distance of D from H, or from a straight line through H and perpendicular to the section, that is from the cylinder-axis[2] of the lens (neglecting the thickness of the lens).

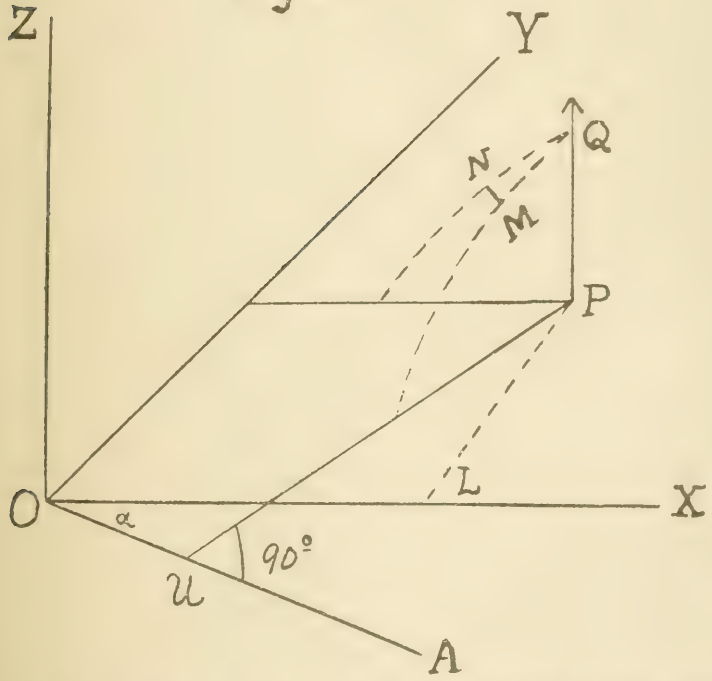
We have $f \text{ tang. } \delta = d,$

or, approximatively, the pencil being supposed small,

$$f\,\delta = d$$

$$\delta = \tfrac{1}{f}\,d \qquad (2)$$

Fig. 2.



In Fig. 2 let O X, O Y, O Z, represent three rectang. axes; let Y O X represent the plane surface of a plano-cyl. lens, and let O A in plane Y O X be the cyl.-axis of the lens, being parallel to the geometrical axis of the cyl. surface of the lens.

Let ang. X O A $= \alpha$.

[2] The cylinder-axis of the lens is to be distinguished from the geometrical axis of the cylindrical surface of the lens.

Let P be a point in plane Y O X. P U perp. to O A.

Let P Q be a ray meeting the plane surface of the cyl. lens O A at P, and having the direction P Q perp. to plane Y O X.

If a ray is perp. to the plane surface of a plano-cyl. lens before refraction, the ray before and after refraction will lie in a plane perp. to the cyl. axis of the lens.

Let P Q be deflected by lens O A to P M. Plane Q M P is perp. to O A.

Let plane Q N P be perp. to O Y.

Let P M = P N = P Q.

Let Q M N be a spherical triang. right angled at N, and let P be the centre of the spherical surface. M Q measures deflection by cyl. lens O A of P Q from position P Q to P M. This deflection measured by M Q may be decomposed into one measured by Q N in plane Q P N perp. to O Y, and another measured by N M in plane N M P, and for this latter we may, for small pencils, substitute by approximation one measured by the same amount N M in plane Q P L perp. to O X, since the smaller Q M is, the less does plane P M N, which is perp. to plane P Q N, differ from plane Q P L, which is also perp. to plane P Q N. Planes P M N and L P Q have L P in common.

We have approximatively for small pencils, small enough to allow us to treat by way of approximation N Q M as a plane triangle,

$$Q\,N = Q\,M, \sin \alpha.$$
$$N\,M = Q\,M, \cos \alpha.$$

Therefore under the conditions mentioned, we may substitute for deflection measured by Q M the two respectively measured by Q N in plane perp. to O Y, and by N M in plane perp. to O X.

We come now to Prof. Oliver's treatment of the subject, from whose manuscript we take Fig. 3 and quote:

"If cylindrical lenses have axes (O A, O B), and A will deflect towards its own axis any perpendicular ray by the amount,

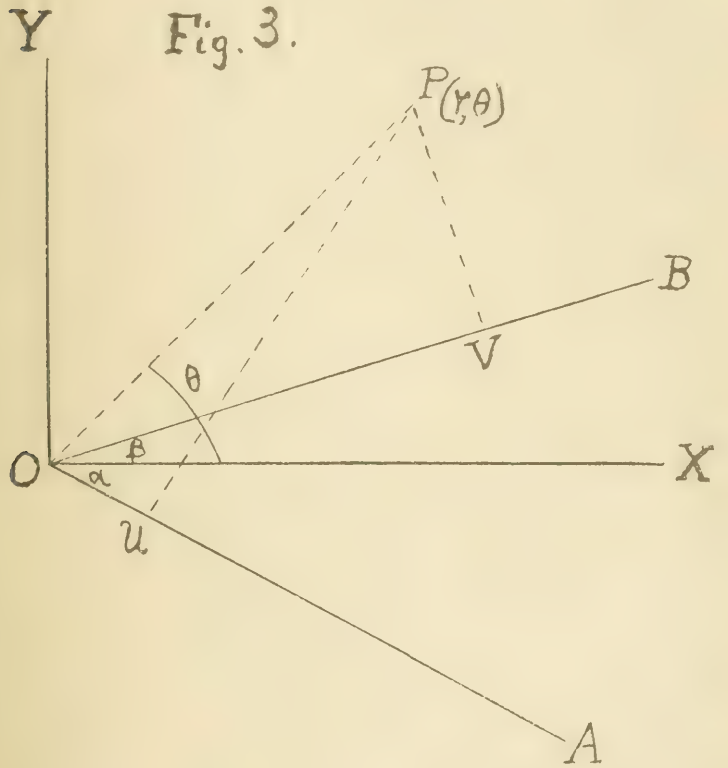
a × distance of ray from O A, while B deflects by

b × " " " " " O B,

a and b being small enough to superpose with neglect of their squares and products;

The angle A O B can be so divided by O X that

(1) a sin 2α = b sin 2β "



"Then the ray incident perpendicularly at point P, whose polar co-ordinates are (r, θ), is deflected simultaneously toward A, *i.e.* in direction P U, by amount a r sin $(\theta + \alpha)$, and toward B, " " " " P V, " " " b r sin $(\theta - \beta)$.

"Multiplying these respectively by (sin α) and (− sin β), and adding, ∴ total deflection toward O Y

$$= a\, r \sin\alpha \sin(\theta + \alpha) - b\, r \sin\beta \sin(\theta - \beta)$$
$$= (a \sin\alpha \cos\alpha - b \sin\beta \cos\beta)\, r \sin\theta$$
$$+ (a \sin^2\alpha + b \sin^2\beta)\, r \cos\theta$$

∴ by (1) deflection toward O Y = $(a \sin^2\alpha + b \sin^2\beta)\, r \cos\theta$.

"Again, using (cos α) and (cos β) as multipliers, we find in like manner deflection toward O X

$$= a\ r \cos\alpha \sin(\theta + \alpha) + b\ r \cos\beta \sin(\theta - \beta)$$
$$= (a \cos^2\alpha + b \cos^2\beta)\ r \sin\theta."$$

This treatment considers by way of approximation that the total deflection by the two lenses is the sum of the separate deflections such as would be caused by each lens in a perpendicular ray.

As r cos θ is the distance of the point P from the axis O Y, and r sin θ is the distance of the same point from the axis O X, we have by (2) for all points P,

$$\frac{1}{f_x} = a \cos^2\alpha + b \cos^2\beta, \qquad [4]$$

and

$$\frac{1}{f_y} = a \sin^2\alpha + b \sin^2\beta. \qquad [5]$$

f_x and f_y are the focal distances respectively of two cyl. lenses whose cyl.-axes are O X and O Y and which together are equivalent to lenses A and B; as the deflections caused by lenses A and B in a perpendicular ray at any point P can be decomposed into other deflections such as would be caused by the designated lenses O Y and O X.

From (1) above, and putting $\alpha + \beta = c$, we may get

$$\text{tang } 2\alpha = \frac{\sin 2c}{\cos 2c + \frac{a}{b}} \qquad [6]$$

α being the angle which O X makes with O A. We might also construct α and β to satisfy (1).

For the Stokes lens, $a = -b$, and to divide the angle A O B into two angles α and β such that

$$\alpha + \beta = A\ O\ B = c,$$

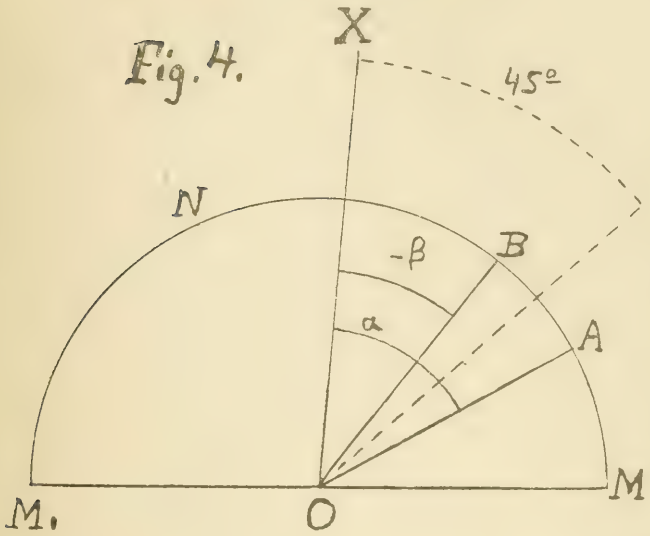
and conformably to the condition

(1) $$a \sin 2\alpha = b \sin 2\beta, \quad \text{or}$$
$$-\sin 2\alpha = \sin 2\beta,$$

we may take

(7) $$\alpha = c + \tfrac{1}{2}(90^\circ - c) = \tfrac{1}{2}c + 45^\circ$$
$$\beta = -\tfrac{1}{2}(90^\circ - c) = \tfrac{1}{2}c - 45^\circ$$

as indicated in the diagram, Fig. 4.



in which

$$B\,A = \alpha + \beta = c = \tfrac{1}{2}\,B\,M$$
$$M_1\,B\,M = 180°$$
$$M_1\,N = N\,B, \qquad \text{and we have}$$
$$M\,N = 2\alpha$$
$$-N\,B = 2\beta;$$

N being the middle point on arc between M_1 and B, we have

$$\sin 2\alpha = -\sin 2\beta$$
$$A\,N = 90°.$$

O X makes with O A angle α and by (7) as is also shown in Fig. 4, O X makes 45° with the radius from O to the middle point of arc A B.

We have thus by (5) above, for the Stokes lens, in which

$$a = -b$$
and $\quad \alpha = \tfrac{1}{2}c + 45°$
and $\quad \beta = \tfrac{1}{2}c - 45°$

$$a \sin c = \frac{1}{f_y} \qquad [8]$$

and by (4) $\quad -a \sin c = \frac{1}{f_x} \qquad [9]$

and therefore the astigmatism of the Stokes lens for angle c of the axes of the two lenses A and B with powers respectively a and — a is the difference of the two powers [8] and [9], or 2a sin c.

In the above only a direct pencil of parallel rays has been considered. The case of a direct pencil of diverging rays has been solved by Hoorweg, A. f. O., 1873, for the Stokes lens, and the general case for any two plano-cyls. might be treated by Hoorweg's method, which in one respect is preferable, as it follows the ray in its refraction, first through the first surface and then through the second.

TRANSACTIONS

OF THE

AMERICAN

OPHTHALMOLOGICAL SOCIETY.

Twenty-Third Annual Meeting.

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1887-8.

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Dr. J. P. Worrell.....Terre Haute, Ind.
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Whole Number.....101.

MINUTES OF THE PROCEEDINGS.

TWENTY-THIRD ANNUAL MEETING.

PEQUOT HOUSE.
NEW LONDON, *July 20, 1887.*

THE Twenty-Third Annual Meeting of the Society was called to order by the President, DR. WILLIAM F. NORRIS, at 10 A.M. The following Committees were appointed:

Committee on Bulletin—DRS. W. W. SEELY and J. A. LIPPINCOTT.

Committee on Membership—DRS. JOHN GREEN, GEO. C. HARLAN, ARTHUR MATHEWSON, SAMUEL THEOBALD, W. H. CARMALT.

Auditing Committee—DR. H. G. MILLER.

The Treasurer's Report was read and referred to the Auditing Committee, and subsequently accepted and ordered to be placed on file.

Voted,—That the assessment for 1887–1888 be $10.

The Society went into Executive Session. The following candidates were elected members: DR. J. B. EMERSON, New York; DR. H. F. HANSELL, Philadelphia; DR. J. OSCROFT TANSLEY, New York; DR. T. Y. SUTPHEN, Newark, N. J.; DR. M. HAYWARD POST, St. Louis, Mo.; DR. EDMUND C. RIVERS, Denver City, Col.

Regular session resumed.

Dr. Edward Jackson and Dr. Wm. H. Morrison were given permission to report the proceedings for several medical journals.

Dr. H. Derby read a memorial of the late Dr. Ezra Dyer, one of the original members of the Society, and on motion of

Dr. Green it was voted that a portrait of Dr. Dyer be published in the next number of the transactions.

Dr. H. D. Noyes spoke briefly of the late Dr. W. S. Little.

The Committee on Bulletin reported, and the following papers were read:

1. "Thirty-Six Cases of Simple Extraction of Cataract without Iridectomy," by Dr. C. S. Bull. Discussed by Dr. H. Knapp.
2. "Report of One Thousand Cataract Extractions with Iridectomy," by Dr. H. Knapp.
3. "Does Sunstroke affect the Eye permanently?" by Dr. J. A. Spalding. Discussed by Dr. Jackson.
4. "A Case of probable Quinine Amaurosis," by Dr. D. B. St. John Roosa. Discussed by Drs. Gruening, Harlan and Roosa.
5. "Clinical Contributions to the Study of Ring-Scotoma," by Dr. Swan M. Burnett. Discussed by Drs. H. D. Noyes, Bull, Knapp, Mittendorf and Wadsworth.
6. "The So-called Orthopedic Treatment of Paralysis of the Ocular Muscles," by Dr. C. S. Bull.
7. "Case of Recurrent Paralysis of the Motor Oculi," by Dr. O. F. Wadsworth. Discussed by Dr. Roosa.
8. "Circumscribed Hyperæmia in Muscular Insufficiency," by Dr. J. A. Lippincott. Discussed by Dr. Jackson.

Adjourned at 2.10 P.M. to 8 P.M.

Meeting called to order at 8 P.M.

Executive Session.

The Committee on Membership reported the following "Standing Rule," which was adopted:

The Report of the Committee on Membership and the election of members shall be the business of the last session of the first day of the Annual Meeting.

The following candidates were elected members: DR. GEO. R. CUTLER, Brooklyn, N. Y.; DR. D. C. COCKS, New York;

Dr. H. S. Oppenheimer, New York: Dr. Chas. McIlwaine, Trenton, N. J.; Dr. David DeBeck, Cincinnati, O.

The reading of papers resumed.

9. "Cases of Acute Primary Glaucoma, of Hemorrhagic Glaucoma, and of Secondary Glaucoma;" illustrated by photomicrographs, by Dr. Wm. F. Norris. Discussed by Drs. H. D. Noyes and Randall.

10. "Sarcoma of Eyelid, Simulating a Meibomian Cyst;" illustrated by photomicrographs, by Dr. B. A. Randall.

11. "The *Hohlschnilt* of Von Jaeger," by Dr. B. A. Randall. Discussed by Drs. Knapp, H. D. Noyes, Theobald, Risley, Randall and Gruening.

12. "Some Cases of Cilio-Retinal Vessels," by Dr. B. A. Randall.

Adjourned at 10.45 P.M. to 9 A.M.

July 21st.

Meeting called to order at 9 A.M.

Reading of papers resumed.

13. "Case of Glioma of the retina; Enucleation; Immunity for fourteen and a half years," by Dr. H. D. Noyes.

14. "Pseudo-Glioma," by Dr. H. D. Noyes. Discussed by Drs. Theobald, Knapp, Carmalt, Fryer, Noyes, Prout, Randall, Gruening and Dennett.

15. "Prolapse of the Lachrymal Gland," by Dr. H. D. Noyes.

16. "A Suggestion for the Relief of Entropion of the Lower Lid," by Dr. H. D. Noyes. Discussed by Drs. Green, Gruening and Noyes.

17. "A Phenomenal Pulsation of the Interior of the Eye," by Dr. W. F. Mittendorf. Discussed by Drs. Howe and Jackson.

18. "Increase of Blindness in the United States," by Dr. L. Howe. Discussed by Drs. H. D. Noyes, Harlan, Burnett, Mittendorf, Callan and Standish.

19. "The Eye of the Adult Imbecile," by Dr. C. A. Oliver. Discussed by Dr. Jackson.

20. "An Additional Group of Cases illustrating Changes of Form in the Eyeballs," by Dr. S. D. Risley. Discussed by Drs. Seely, Risley, Knapp, Burnett, Randall, Norris, Carmalt and Theobald.

21. The Pathogenesis of Pterygium," by Dr. S. Theobald. Discussed by Drs. Roosa, Theobald and Lippincott.

22. "A Case of Recurrent Retinal Hæmorrhages followed by the Outgrowth of Numerous small Blood Vessels from the Optic Disc into the Vitreous Humor," by Dr. S. Theobald. Discussed by Drs. Carmalt, Fryer, Knapp and Wadsworth.

23. "Embolism of the Central Retinal Artery," by Dr. G. C. Harlan.

24. "Chronic Glaucoma," by Dr. D. Coggin.

25. Dangers to the Eyes of Iron-Workers from the Use of old Hammers," by Dr. G. C. Harlan.

26. "A Case of Retinitis Pigmentosa treated Electrically," by Dr. Myles Standish.

27. Aseptic Cataract Extraction with Irrigation," by Dr. C. H. Williams. Discussed by Drs. Howe and Gruening.

28. Case of Congenital, Zonular, Grayish-White Opacity around the Fovea, by Dr. O. F. Wadsworth. Discussed by Dr. Knapp.

29. "Separation of the Retina in both Eyes, with Albuminuria of Pregnancy; Replacement of Retina," by Dr. O. F. Wadsworth. Discussed by Dr. Risley.

30. "Coloboma of the Optic Nerve," by Dr. B. A. Randall.

31. "Peculiar Form of Granular Conjunctivitis associated with Icthyosis," by Dr. F. Buller.

Adjourned at 2.10 P.M. to 3.30 P.M.

Meeting called to order at 3.30 P.M.

Reading of papers resumed.

32. "An Electric Light Ophthalmoscope," by Dr. W. S. Dennett. Discussed by Dr. Hay.

33. "Photographs of the Interior of the Eye," by Dr. L. Howe.

34. "Modification of the Ophthalmoscope," by Dr. L. Howe.

35. "Test Lenses," by Dr. E. Jackson.

36. "Chorio-Retinitis, and Coloboma of Iris, Lens and Choroid, by Dr. C. A. Oliver.

37. "Modification of the Ophthalmoscope," by Dr. S. D. Risley.

38. "Modification of the Ophthalmoscope," by Dr. Swan M. Burnett. Discussed by Drs. Wadsworth, Jackson, Dennett, Randall, Green and Burnett.

Dr. John Green spoke of the occurrence of Temporary Myopia during Convalescence from Iritis, observed in himself and others. Discussed by Dr. Wadsworth.

Dr. Randall reported a case of Rapid Development of Lenticular Opacity.

The Society went into Executive Session.

Dr. Lucien Howe offered the following Preamble and Resolutions:

Whereas,—The Census Reports indicate that there has been an increase in the number of blind in the United States more than four times as great as that of total population;

Whereas,—An inquiry as to the causes of this shows that it is largely due to contagious diseases of the eye, therefore,

Resolved,—That a Committee of three be appointed to examine further as to this apparent increase, and recommend means for its prevention.

Resolved,—That the President of the United States and the Secretary of State be hereby respectfully requested to furnish this Committee with whatever letters or other recommendations may be necessary to further their investigations in this country or elsewhere.

Resolved,—That officials in charge of Residential Schools and similar institutions be also requested to assist the Committee to any extent in their power.

The Preamble and Resolutions were adopted.

The President appointed Dr. Lucien Howe, Dr. Swan M. Burnett and Dr. J. A. Andrews as this Committee.

The Committee appointed at the last meeting of the Society to confer with Committees of other medical societies with regard to the organization of a Convention or Congress of such societies, reported

That the Committees of the various societies met at Washington, September 24th, 1886, and adopted the following resolutions:

Resolved,—1. That it is desirable that the following Societies: The American Surgical Association, The American Ophthalmological Society, The American Otological Society, The American Neurological Association, The American Laryngological Association, The American Gynecological Society, The American Dermatological Association, The American Climatological Association, The Association of American Physicians and Pathologists, shall arrange for a conjoint meeting in the city of Washington, in the month of September, 1888, and subsequently at intervals of three years, at the same time and place.

2. That this arrangement shall not interfere in any way with the autonomy of each special Society; and that each Society shall retain the right to withdraw at any time from this conjoint scheme.

3. That the special feature of the meeting shall be the conjoint assemblage of the special Societies on two evenings during the session; on one of which there shall be an address delivered by the President of the conjoint meeting, and on the other there shall be communications by a referee and a co-referee on some subject of general professional interest.

4. That each special Society approving this report is invited to appoint one representative (with an alternate), and that the representative so appointed shall constitute an Executive Committee to serve for one year, with power to elect such officers for the first conjoint meeting as may be deemed necessary; to prepare a programme for said meeting; to make all other necessary arrangements, and to prepare and submit a plan of organization for future meetings.

5. That all expenses connected with the conjoint sessions shall be apportioned equally by the Executive Committee among the special Societies participating.

That the Committee of the Ophthalmological Society, believing a conjoint meeting oftener than once in five years to be undesirable, declined to vote for the resolutions, and now presented them to the Society for its action without making any recommendation.

After some discussion, Dr. Green offered the following motion, which was adopted :

That the American Ophthalmological Society appoint a representative and alternate to the proposed Executive Committee of arrangement for the Congress of special Societies, with this proviso, that, in making this appointment, this Society does not commit itself to an approval of the present sketch in all its details.

Dr. Wm. F. Norris was elected representative and Dr. D. B. St. John Roosa alternate.

The Committee on Membership proposed the following as officers for the ensuing year, and they were elected by ballot :

President—Dr. William F. Norris.
Vice-President—Dr. H. Derby.
Secretary and Treasurer—Dr. O. F. Wadsworth.
Corresponding Secretary—Dr. J. S. Prout.
Publishing Committee—Drs. H. Derby and G. Hay, the Secretary (*Ex-Officio*).

The Committee recommended that the Annual Meeting in 1888 be held at the Pequot House, New London, and the recommendation was adopted.

The records of the meeting were read and adopted.

Adjourned at 6 P.M.

Present at the Twenty-third Annual Meeting:

Dr. C. R. Agnew.
Dr. J. A. Andrews.
Dr. Edwin W. Bartlett.
Dr. Charles S. Bull.
Dr. F. Buller.
Dr. Swan M. Burnett.
Dr. Peter A. Callan.
Dr. F. P. Capron.
Dr. W. H. Carmalt.
Dr. David Coggin,
Dr. W. S. Dennett.
Dr. Hasket Derby.
Dr. B. E. Fryer.
Dr. John Green.
Dr. Emil Gruening.
Dr. George C. Harlan.
Dr. Gustavus Hay.
Dr. E. E. Holt.
Dr. Lucien Howe.
Dr. Edward Jackson.
Dr. H. Knapp.
Dr. J. A. Lippincott.
Dr. Arthur Mathewson.
Dr. C. S. Merrill.
Dr. H. G. Miller.
Dr. W. F. Mittendorf.
Dr. William F. Norris.
Dr. Henry D. Noyes.
Dr. Charles A. Oliver.
Dr. J. S. Prout.
Dr. B. Alex. Randall.
Dr. Samuel D. Risley.
Dr. D. B. St. John Roosa.
Dr. H. S. Schell.
Dr. W. W. Seely.
Dr. J. A. Spalding.
Dr. Myles Standish.
Dr. T. Y. Sutphen.
Dr. Samuel Theobald.
Dr. O. F. Wadsworth.
Dr. Charles H. Williams.
Dr. Henry W. Williams.

Present by invitation:

Dr. Geo. R. Cutter, Brooklyn; Dr. Marshall, Montreal; Dr. L. W. Taylor, Wilkesbarre; Dr. F. M. Wilson, Bridgeport; Dr. D. N. Skinner, Me.; Dr. Rhoades, U. S. N.

O. F. Wadsworth,
Secretary.

DR. EZRA DYER.

DR. DYER.

Another of the founders of this Society has passed away since its last annual meeting. Dr. Ezra Dyer, of Newport, R. I., died February 9th of the present year.

Dr. Dyer was born in Boston, October 17th, 1836, and graduated at Harvard in the class of 1857. Previous to entering College he had already spent some time in the study of medicine, under the tuition of Dr. Jeffries Wyman, Dr. Morrill Wyman and Dr. John Ware. After graduation he entered the Medical School, was appointed house surgeon at the Massachusetts General Hospital in May, 1858, and spent the following year in that institution. In the summer of 1859 he took the degree of M.D. and sailed for Europe soon after. Having passed three months in the Rotunda Hospital, Dublin, he went to Bonn and engaged in the study of German, leaving that place and reaching Vienna at the close of the year.

He had always intended to gain some knowledge of diseases of the eye before embarking in general practice. With that end in view he became an attendant at the clinique of Professor Arlt, and took one of his operation courses. Gradually his interest in Ophthalmology grew deeper and deeper, and the attention he was led to devote to this branch of surgery became more and more exclusive. As will be remembered it was at this time that our science was beginning to be enriched by so many discoveries. The ophthalmoscope had been but a few years in existence. Iridectomy for glaucoma dated back two years. Donders' "hints on the choice and use of spectacles" had been published but twelve months previously. And to set these new views clearly before a class of students, bringing to their elucidation his own great ability as a teacher and ripened experience as a practitioner, no better man could

have been found than Arlt, then in his prime, a martinet among professors, but the ablest of teachers and kindest of men. He devoted the whole force of his intellect to the personal instruction of the dullest among his hearers, and was idolized by the poor who frequented his clinique in great numbers. How often was he seen to thrust a gulden, instead of a prescription, into the hand of some forlorn creature, in whose case insufficient nourishment was evidently the cause of disease. It was the interest in Ophthalmology awakened by the teaching of Arlt that led Dyer to devote his whole time to its study, and to form the resolution to confine himself to its practice.

He remained in Vienna until near the fall of 1860, and then went to Berlin, furnished with a letter of introduction from Arlt to von Graefe. It will be long before the friend who accompanied Dyer on the occasion of its presentation forgets their first interview with the illustrious master. They found Graefe breakfasting at his residence in the Carlstrasse, the table covered with a medley of books, papers, instruments, manuscripts, and the accessories of a German meal. Half a dozen new hats lay upon the sofa, evidently sent for Graefe to try on at home, because he had no time to visit the hatter. He was reading one letter and apparently dictating another to his amanuensis who sat by his side. His welcome was warm, but he seemed to ruefully regard the near approach of the lecture season. "Meine schoenen Morgenstunden sind vorbei," he said in a tone of grief. As they turned to leave the room he called them back and said "Eins noch, werden sie nur Praktikanten. Dabei lernt man am meisten."

The class that winter consisted of sixty or seventy individuals, some six of whom volunteered for this service, among them Dyer. Half an hour before the arrival of the Professor the Praktikants were admitted, and one or more selected patients assigned to each. They were to form, unaided, a diagnosis, prognosis and plan of treatment. When the class had arrived and the case was called, the Praktikant occupied a chair by the side of Graefe, was catechized by him on the case, and expected to draw any morbid appearance on the

blackboard. To all this was to be added the difficulty of expressing one's self in a foreign language. Dyer, however, eminently distinguished himself in this position, and was subsequently selected by Graefe to fill a temporary vacancy in his corps of assistants. Berlin was left in the spring of 1861, as soon as Graefe's winter course was completed. After passing some months in London at Moorfield's, Dyer went to Paris, where he attended the cliniques of Desmarres and and Sichel. He next visited Utrecht and passed several weeks with Donders and Snelling. It was here that his marked mathematical ability became so apparent, difficulties at which his fellow students recoiled being easily solved and readily explained by him. It had been his intention to return to Berlin for another winter with Graefe, but the latter's serious and well nigh fatal illness changed this plan, and he made the voyage home in November, 1861.

He soon established himself in Philadelphia and rapidly acquired a most excellent practice. In 1862 Dr. Hammond, then Surgeon General, invited him to take charge of all eye and ear cases then in the Philadelphia Army Hospitals. Wards were assigned him in the West Philadelphia Hospital, and he remained in charge until 1865. The nature of his labors, as well as an illustration of his kindness of heart, may be gathered from the following extract from one of his letters to his wife.

"Philadelphia, July 12, 1863. To-day I had over ninety to dress myself. On my way home from the hospital I saw, just above the bridge, a whole train of wounded rebels, and they wanted attention. I hitched Prince and 'went in.' The day was hot, and, though I took off coat and waistcoat, I was drenched. Deliver me from such a scene again. They were brought in freight cars, lying on the floors, which were swimming and slippery from filth. We got water and sponges, and some good women brought old linen and made lint and bandages, while I climbed into the cars and worked. Many of the shell wounds had mortified and were full of maggots. The poor fellows did not complain, but were in a horrid state. Officers and men were all together, and as soon as one was fixed up a dozen said: 'Doctor, can't you look at me now?' I don't know how long I was there."

The meeting preliminary to the organization of the American Ophthalmological Society was held at the office of Dr. H. D. Noyes in New York, January 9, 1864; eight gentlemen being present. Dyer had been invited to this meeting and left Philadelphia for the purpose of attending it, but the ferry boat from Jersey City was detained by ice in the river, and he reached New York after the proceedings were over. But three of those present at this meeting are now members of the Society. At the first regular meeting, in June of the same year, Dyer was present, and he was ever after a regular attendant, until sickness began to interfere with his leaving home. It was in 1865 that he read before the Society his now classical paper on "Asthenopia not connected with Hypermetropia," in which he proposed, for cases of asthenopia not depending on any error of refraction or muscular insufficiency, the system of ocular gymnastics which has since been known under the name of "Dyerizing," and extensively practised both at home and abroad. It was the old "morbid sensibility of the retina," for a treatise on which the Massachusetts Medical Society once offered a prize. This malady was one of the most common affections of the eye with us at the East, and previous to the publication of Dyer's views one of the most incurable. He needs no other work on which to base a claim to the grateful remembrance of both present and future colleagues.

In 1866 he published a paper on "fracture of the lens from death by hanging." Subsequently he was appointed to the Wills Eye Hospital, and held the place as long as he remained in the city. It was in 1873 that the health of a member of his family seemed to require a change of climate, and in consequence Pittsburgh was selected as a place of residence. It was a serious sacrifice for Dyer to leave the city where he had won so enviable a position. He was, in Philadelphia, emphatically a pioneer. Not to the manor born he introduced specialism into a medical community hostile to it both from tradition and on principle. Nevertheless he conquered opposition, gained friends, acquired a large practice, and smoothed the way for his successors.

At Pittsburgh he was soon busily engaged in private practice, and received both a Dispensary and a Hospital appointment. In 1876 he again wrote on "the treatment of asthenopia by systematic exercise," and read the paper before the International Congress. In the autumn of 1879 he met his first accident, caused by springing suddenly on the slippery deck of a ferry boat. He fell and ruptured the ligaments of the left knee. After this he never again walked without some difficulty, the knee occasionally giving way unexpectedly under him. It was thus that, in the spring of 1880, he fell while stepping from a horse car, breaking the right thigh and dislocating the hip. A critical illness followed, confining him to his bed for nearly six months. He never wholly recovered his strength and activity. A spinal affection came on, two years later, and it was resolved, as he could no longer bear the fatigue of going from his house in the country to his office in town, and as his health was seriously broken, that he should seek a milder climate. He removed to Newport, R. I., in 1883. The change seemed at first beneficial, and he regained some of his former activity, though not his endurance. He still occasionally attended our meetings, and in 1884 invented and exhibited to the Society the ingenious and beautiful perimeter with which we are familiar.

During the past winter his health sensibly failed, and early in the present year his weakness, loss of appetite and sensitiveness to cold alarmed his family, who urged a journey to Florida. In this he gladly acquiesced, and for a time displayed some of his old enthusiasm and liveliness. His letters, written on the voyage out, were bright and entertaining, but on arriving at St. Augustine he began again to lose ground, rapidly grew weaker, found himself unable to take nourishment, and in a few days resolved to turn his face homewards, writing his wife that he should sail for New York in the steamer of February 5th. Once on the boat, which he was unable to reach without assistance, he took to his bed. He grew worse and worse, was wholly unable to retain any food, and on the afternoon of February 9th he quietly passed away,

his death taking place on the steamer, which had been some time detained by the fog inside Charleston Bar.

"Ich hatt' einen Camaraden
Einen bessern findst du nit,"

runs one of the old student songs of which he was so fond. And one who has known him most intimately for more than thirty years can pay no better tribute to him than is expressed in these simple lines. Many a difficulty in the student's path was smoothed away by his stronger intellect, many an interest of his own unhesitatingly sacrificed for the sake of a friend. Unswerving integrity, unselfish and enduring loyalty, a child-like faith in those he loved, a memory ever green and bright of days long past, these were among the characteristics of Ezra Dyer. No truer heart ever beat.

REPORT OF THIRTY-SIX CASES OF SIMPLE EXTRACTION OF CATARACT WITHOUT IRIDECTOMY.

BY CHARLES STEDMAN BULL, M.D.,
NEW YORK, N. Y.

FOR convenience of reference, the detailed report of these thirty-six cases is presented in tabular form, and is prefaced by a brief statement of the nature of the case, the complications if any existed, the technique of the operation and after-treatment, with some remarks upon the process of healing and the resulting vision, together with a consideration of the advantages and disadvantages of the operation.

Sex of the patients.—Of the thirty-six (36) cases in which Daviel's operation was performed, twenty (20) were males and sixteen (16) were females.

Age of the patients.—The youngest patient was thirteen (13) years of age, and the oldest patient was seventy-nine (79).

In twenty-four (24) cases, the cataract was of the hard senile character. In eleven (11) cases, it was traumatic in origin and soft or semi-soft in consistency. In one (1) case it was of secondary or inflammatory origin.

Complications.—There were corneal maculæ in three (3) cases. Tremulous iris and fluid vitreous were present in seven (7) cases. There was old choroiditis in five (5) cases, and irido-choroiditis in one (1) case.

Antisepsis.—Careful antiseptic precautions were taken in every case, before, during and after the operation. The patient's head and face were carefully washed with a solution of mercuric bichloride (1–1000) before the operation, and the conjunctival cul-de-sac was thoroughly cleansed several times on the day of operation with a solution of 1–5000. This was done carefully just before the operation, and then a five per cent. (5%) solution of cocaine hydrochlorate was instilled

several times until the desired anæsthesia was produced. A final washing of the conjunctiva, cornea and eyelids was then done with a solution of mercuric bichloride (1–5000). The hands of the operator and assistants were carefully washed with soap and water, and then thoroughly cleansed with a sublimate solution (1–1000). The instruments were sterilized by a carbolic acid solution, and lay in a bath of absolute alcohol till ready for use.

Operation.—The operation was always done while the patient was lying in bed in the room where he was to remain, so as to avoid all unnecessary movements. A speculum was used in every case to hold the lids open. The knife used was the long, narrow knife, somewhat narrower than the Græfe instrument, and on being introduced through the cornea on the temporal side, was passed rapidly across the anterior chamber to its point of exit, and the corneal flap, measuring about two fifths ($\frac{2}{5}$) of the circumference of the cornea, was rapidly completed. Usually there is no prolapse of the iris on the withdrawal of the knife, but if it should occur at this stage of the operation, it is allowed to remain until after the extrusion of the lens. The sterilized capsulotome is then introduced, and the anterior capsule opened by a quadrilateral incision. The speculum was then removed, and by pressure and counter-pressure through the lids with the index fingers, or with one finger and a broad spatula, the lens was readily caused to present at and pass out through the corneal wound.

The cul-de-sac and edges of the lids were then carefully irrigated with the bichloride solution (1–5000), and if the reduction of the prolapsed iris had not occurred spontaneously, it was then carefully replaced by delicate manipulation with the spatula. All soft lens matter was then gently washed away with the antiseptic solution, and if any lens substance or blood clots remained in the anterior chamber, they were removed by gentle irrigation of the anterior chamber with a solution of mercuric bichloride (1–10,000). A drop of a solution of eserine sulphate (a grain to the ounce of a saturated solution of boracic acid) was then instilled into the anterior chamber, and the lips of the corneal wound were then brought

into close coaptation. A final washing of the cul-de-sac was then done, and a little eserine ointment in some cases was spread along the ciliary margin of the lids. Then a pad of sterilized linen gauze was placed over the lids, and over this a wad of absorbent cotton soaked in a solution of bichloride (1–2000); over this a wad of dry absorbent cotton, and then a bandage over both eyes. Unless indicated, this bandage was not removed for two days, but the eserine solution was instilled underneath the bandage twice daily. At the end of forty-eight (48) hours the bandage was removed, and the lids and adjacent portions of the face carefully washed with the bichloride solution (1–2000), but unless there were signs of irritation or inflammatory action, the lids were not opened till the fourth (4th) day. They were then carefully cleansed, opened, and the eyeball and cul-de-sac gently irrigated with the bichloride solution (1–5000), and the eye was then examined. If the appearance of the eye were favorable, the eserine solution was again instilled and the bandage reapplied to the operated eye for another day, and then was removed altogether.

The *reduction* or *return* of the *prolapsed iris* to the anterior chamber occurred spontaneously in sixteen (16) cases, while in the remaining twenty (20) cases, it was replaced by the spatula.

The *healing process* was in most cases favorable, though occasionally somewhat protracted. There was *no* case of suppuration. There was one (1) case of so-called "striped" keratitis, extending from the wound over the entire cornea, but this soon subsided under the influence of hot water and a bandage, and the cornea subsequently became entirely clear. There were six (6) cases of iritis plastica of a mild type, which yielded readily to treatment, and two (2) cases of moderate irido-cyclitis with formation of a membrane in the pupil.

In one (1) case the wound healed on the third day, and the healing process progressed favorably till the ninth (9th) day, when the epithelium from the lower half of the cornea was cast off. This was, however, regenerated in three (3) days under the reapplied bandage, and there was no further com-

plication in the case. In another case, the corneal epithelium on the third day was raised up in four or five spots by a clear exudation, just as in keratitis bullosa, but the fluid was absorbed and the small blisters subsided, leaving the cornea clear.

In twenty-four (24) cases the healing process was perfectly normal in every respect, though in some rather slow.

Prolapse of the Iris.—This did not occur in any case.

Incarceration of the Iris.—In the first thirty (30) cases there was neither secondary prolapse nor incarceration of the iris in the wound, and this was attributed to the great care exercised in the operation, which was done with the patient lying in bed, from which he was not permitted to be removed until the wound had healed. But in the last six (6) cases, in which the same care was taken, incarceration of the periphery of the iris occurred in every case. There was no prolapse and no incarceration of the sphincter iridis, but the iris became adherent to the inner lips of the wound more or less extensively near its periphery, causing considerable irritation and a somewhat prolonged circum-corneal injection, with distortion and displacement of the pupil. This latter symptom was noticed in some cases where there was no incarceration of the iris tissue; and this displacement with or without incarceration occurred in sixteen (16) cases. There were posterior synechiæ or adhesions of the iris to the remains of the lens-capsule in thirteen (13) cases.

The average duration of in-door or hospital treatment was somewhat more than twenty days (20.75), the shortest period being twelve (12) days and the longest forty-seven (47) days.

A secondary operation, usually a needling or laceration of the posterior capsule, was required in twelve (12) cases, and excision of a piece of very thick membrane and capsule combined in one (1) case.

Accidents during the Operation.—Prolapse of the vitreous occurred in four (4) cases. Dislocation of the lens downwards occurred in two (2) cases. Collapse of the cornea occurred in two (2) cases.

As regards the after treatment of these cases, but little need be said. Rest in bed is of the utmost importance until

the wound is healed. Atropia was not instilled in any of the cases, except where iritis occurred, and even here a one-grain solution was deemed sufficiently strong. In the two cases of irido-cyclitis, a four-grain solution of atropia sulphate was instilled as often as was thought necessary. No eserine was employed after the external lips of the wound had healed. The incarceration of the iris which occurred in six cases may possibly have been due to this fact, but as there was no incarceration in the first thirty cases, where the eserine had also been discontinued after the healing of the external lips of the wound, it is extremely doubtful whether this explanation will suffice.

The degree of acuteness of vision obtained in these thirty-six cases, by the simple method of extraction, was as follows:

V. = $\frac{20}{30}$ in two (2) cases.
V. = $\frac{20}{40}$ in eight (8) cases.
V. = $\frac{20}{50}$ in eight (8) cases.
V. = $\frac{20}{70}$ in ten (10) cases.
V. = $\frac{20}{100}$ in five (5) cases.
V. = $\frac{20}{200}$ in two (2) cases.
V. = 0 in one (1) case (eye previously blind).

Thus it will be seen that V. = $\frac{20}{20}$ was not obtained in any case, while a visual acuity of $\frac{20}{200}$ *or better* was obtained in thirty-five (35) cases, or *all but one.*

The number of cases here tabulated is as yet far too small to admit of the formation of any opinion as to the advantages or disadvantages of this method of operating. It should not be forgotten that it is essentially an old operation to which some surgeons are returning, and not a new one which is still on trial. Wecker and Panas, who have done more than all others to revive it, are most enthusiastic in their praise, but they have not as yet furnished us with any reliable or detailed statistics. Simple extraction without iridectomy certainly preserves the natural appearance of the iris, especially if there be no incarceration of the iris tissue, and a round and movable pupil is more serviceable than a truncated or key-hole pupil. I have no doubt in my own mind that eccen-

tric vision is better in these cases than after extraction with iridectomy, for a number of these patients stated that they had very little difficulty in crossing crowded streets. Central vision, as exemplified in the cases tabulated, cannot be regarded as any better than that found in cases of extraction with iridectomy, though I think it may be considered fully as good. One advantage the simple method of extraction certainly possesses, and that is, there is much less likelihood of incarceration of bits of capsule or portions of vitreous in the corneal wound than in the peripheral linear incision with iridectomy. On the other hand the technique of the operation is decidedly more difficult of performance. The knife must be passed very rapidly across the anterior chamber, in order to prevent the iris from falling on its edge and being divided. The extrusion of the lens through the corneal wound is more difficult, because of the presence of the prolapsed iris, which partially fills the wound. For the same reason the danger of prolapse of the vitreous is more imminent, the pressure required to effect displacement and extrusion of the lens being greater. The removal of fragments of lens cortex, or capsule, or blood clots from the anterior chamber and field of the pupil, is much more difficult in this operation, and irrigation of the anterior chamber seems almost a necessity. Though I have had no personal experience of secondary prolapse of the iris, yet it would seem much more likely to occur in the simple operation than in the extraction combined with iridectomy.

From my limited experience, it is not possible to lay down rules for a proper choice of cases in which this operation may be done. A narrow anterior chamber would, I think, contraindicate its performance. It will probably be found practicable in the majority of cases of cataract, though in many an iridectomy will be indicated, and even found to be necessary, only after the corneal section has been completed. When there is reason for supposing in a given case that the vitreous is fluid or that the zonule is ruptured, either wholly or in part, an iridectomy renders the operation safer. If, after completing the corneal section, the iris is found rigid and inelastic, any attempt to force the lens past such an unyielding iris would

Name	Age	Nature of Cataract	Complications	Operation	Infection of Eye	Healing Process	Stitches or Incarceration of Iris	Position of Stitches	Duration of Treatment in Days	Primary Reaction Vision	Secondary Operation	Ultimate Vision
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	One	28	[illegible]	[illegible]	[illegible]
Mrs. [illegible]	[illegible]	[illegible]	[illegible]	Normal	Staphylococcus	Normal.	None.	Two	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal	Streptococcus	Normal.	None.	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal.	Staphylococcus	Normal.	None.	None	[illegible]	[illegible]	Discission of thickened cap	[illegible]
Mrs. H.	[illegible]	[illegible]	None	Normal	Streptococcus	Normal.	None	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal.	Staphylococcus	Normal.	None.	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Corneal flap [illegible]	Staphylococcus	Slow.	None.	Two.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal.	Streptococcus	Slow.	None	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal.	Staphylococcus	Normal.	None.	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal.	Streptococcus	Slow.	None.	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal.	Staphylococcus	Slow.	None	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal	Streptococcus	Normal.	None	Several.	[illegible]	[illegible]	[illegible]	[illegible]
Mr. P. S.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	One.	[illegible]	[illegible]	[illegible]	[illegible]
Mrs. E. L.	[illegible]	Hard. L. E.	None.	Normal.	Staphylococcus	Normal.	None.	Two.	[illegible]	[illegible]	[illegible]	[illegible]
Mrs. B. C.	[illegible]	[illegible]	[illegible]	Normal	Streptococcus	Normal.	None.	[illegible]	15	[illegible]	[illegible]	[illegible]
Mr. J. M.	[illegible]	[illegible]	[illegible]	Normal	[illegible]	[illegible]	None	Several.	17	[illegible]	[illegible]	[illegible]
Mrs. S.	[illegible]	Hard. L. E.	[illegible]	Normal	[illegible]	Normal	None	None.	16	[illegible]	[illegible]	[illegible]
Mrs. G.	[illegible]	[illegible]	None	Normal	[illegible]	Slow	None	None.	[illegible]	[illegible]	[illegible]	[illegible]
Mr. [illegible]	[illegible]	[illegible]	[illegible]	Normal	[illegible]	Normal	None.	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal	[illegible]	[illegible]	None	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Margaret W.	[illegible]	[illegible]	[illegible]	Normal.	[illegible]	[illegible]	None	Two	[illegible]	[illegible]	[illegible]	[illegible]
Gertrude M.	[illegible]	[illegible]	None	Normal	Pneumococcus	Slow.	None	None.	[illegible]	[illegible]	Discission	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal	[illegible]	[illegible]	None	Two	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	None	Staphylococcus	Normal	None	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal	[illegible]	Normal	None.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal	[illegible]	Slow.	None.	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal	[illegible]	[illegible]	None	One	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal.	[illegible]	Normal	None	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	Several	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	[illegible]	[illegible]	[illegible]	None	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	None	Normal	[illegible]	[illegible]	[illegible]	None.	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	Normal.	[illegible]	[illegible]	[illegible]	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None.	[illegible]	[illegible]	[illegible]	[illegible]

probably cause loss of vitreous, or dislocation of the lens, or both, besides bruising the iris, and in such cases an iridectomy should always be done. The same reasoning would apply to a case in which the corneal incision was too short, though an attempt might be made here to increase the length of the incision in the cornea with the scissors. If the iris prolapse on the knife and is injured, the injured portion should of course be excised. Further experience will no doubt lead to a modification of some of these views.

DISCUSSION.

Dr. Knapp.—Since June 10th, 1886, I have performed extraction without iridectomy, according to Panas, sixty-eight times, with the following results: normal recovery in fifty-seven cases; iritis, mild, in three cases; iritis, severe, in one case; protrusion of the iris in three cases; incarceration of the iris without protrusion in two cases; capsulo-iritis in one case, V. $= \frac{1}{\infty}$; suppuration in one case, V $= 0$; in this case the suppuration was secondary, owing to bad behavior of the patient and dacryocystoblenorrhœa. The vision after the primary operation was as follows: 0 one, $\frac{1}{\infty}$ one, $\frac{6}{200}$ one, $\frac{8}{200}$ one, $\frac{15}{200}$ one, $\frac{20}{200}$ seventeen, $\frac{20}{100}$ ten, $\frac{20}{70}$ seventeen, $\frac{20}{50}$ eight, $\frac{20}{40}$ two, $\frac{20}{20}$ two.

A secondary operation was required thus far in twenty-seven cases. Vision after the secondary operation was as follows: $\frac{20}{200}$ one, $\frac{20}{100}$ four, $\frac{20}{70}$ five, $\frac{20}{50}$ four, $\frac{20}{40}$ two, $\frac{20}{30}$ six, $\frac{20}{20}$ five: total twenty-seven. No reaction in any case, vision improved in all.

The vision of the above twenty-seven cases before the secondary operation was performed, was as follows: $\frac{15}{200}$ one, $\frac{20}{200}$ nine, $\frac{20}{100}$ five, $\frac{20}{70}$ six, $\frac{20}{50}$ three, $\frac{20}{30}$ three.

In addition to the above sixty-eight cases, an iridectomy was made in eight cases where Panas's operation was first attempted. Of these cases, one had mild iritis, the others healed smoothly. A secondary operation has not been done in any of these cases. Vision $= \frac{20}{100}$ in two, $\frac{20}{70}$ in three, $\frac{20}{50}$ in two, $\frac{20}{30}$ in one.

In the cases operated on by this method I find the pupillary area obstructed by wrinkled capsule just as often as after any other method, except, of course, extraction within the capsule, and to give the patient full sight a secondary operation may be not less frequently required. In one case there was secondary prolapse of the iris. This occurred on the

fourth day. I saw the patient in the morning and allowed her to change her dress. She went to the wash cabinet and hurt her eye. About one o'clock, I reduced the prolapsed iris. This was partially involuntary on my part, as by a sudden movement of the patient the forceps went into the eye, reducing the prolapsed part. With a probe introduced into the anterior chamber, I smoothed out the folded iris and obtained a round pupil. The recovery was without any reaction, and the pupil remained central.

Another case was of particular importance. I operated on a man who for years had been addicted to the excessive use of alcohol. The operation and recovery normal. V. = $\frac{2}{50}$, with slightly wrinkled capsule. In the fourth week, I made, under cocaine anæsthesia, a smooth division of the capsule in order to obtain perfect sight. For twenty-four hours, there was no trace of reaction. The following night he was attacked with acute nephritis and dysentery. The stools were bloody and the urine was loaded with albumen. The next day he had circumcorneal injection and chemosis, and the eye was very hard. For two days eserine reduced the tension, but the pupil did not contract. There were no adhesions. On the third day, the eye was as hard as in any case of acute glaucoma that I have ever seen. Vision was reduced to simply seeing the hand. The conjunctiva was swollen, the cornea somewhat dull, and the pupil dilated. What connection this had with the acute nephritis and the man's habits, I do not know. On the third day, I made an iridectomy as in a case of idiopathic acute glaucoma. This cured the eye without any reaction. The pupil cleared up, the haziness of the cornea disappeared, and the eye has remained in this condition. In the anterior chamber there was considerable blood, which had come from the wound, and there was blood in the vitreous. It is quite possible that in the acute attack, that he had twenty-four hours after the operation, there was some hemorrhage into the eye which caused the trouble.

On the whole, I may say that this, the so-called simple method of extraction, seems to me to be as safe as that with iridectomy.

REPORT ON A SERIES OF ONE THOUSAND SUCCESSIVE CASES OF EXTRACTION OF CATARACT WITH IRIDECTOMY.

By H. KNAPP, M.D.,

NEW YORK.

THE thousand cases of extraction of cataract on which I beg to report, were performed during the years from 1866 to 1886, the first three hundred at Heidelberg, the following seven hundred at New York. They form the subject of eight articles[1] which give detailed accounts of what seemed of importance in the different series of cases. The last publication only is fragmentary and will be supplemented at an early day by a paper in the Arch. of Ophthalmology. It cannot be my intention, gentlemen, to lay before you a lengthy report of these operations, but I may be allowed to speak of some points which larger numbers will bring out more convincingly than smaller.

The question which interests us most is: *What influence has a certain method of operating on the final visual results?* As the method of extraction has undergone considerable essential modifications during the time these one thousand cases were operated upon, I will put together in a table the results which have been obtained in the different series. With these figures on hand, I can then inquire into the merits and de-

[1] Graefe's Archiv, Bd. xiii., Abth 1, pp. 75–125, 1866.
Ibidem. Bd. xiv. 1. pp. 267–284. 1867.
Archives of Ophthal. and Otol. I. 1. pp. 103–131. 1869.
Ibidem Vol. vi. Nos. I. & II. 1877.
Archives of Ophthal. Vol. viii. p. 200, etc. 1879.
Ibidem. Vol. x. p. 295, etc. 1881.
Ibidem. Vol. xii. p. 69–104, etc. 1883.
New York Med. Journ., Vol. xv. p. 204, etc. Feb. 19, 1887.

merits of the operative method employed in each series. Cases with

V. $= \frac{20}{200}$ to $\frac{20}{20}$ have been entered as good results.
V. $= \frac{201}{200} - \frac{1}{200}$ " " " " moderate results.
V. $< \frac{1}{200}$, i. e. $\frac{1}{\infty}$ and 0, have been entered as failures.

SERIES OF 100 CASES.	TIME OF OPERATION.	METHOD OF EXTRACTION.	RESULTS.			FAILURE FROM	
			Good.	Moderate.	Failure.	Suppuration.	Other causes.
First	1866	Very peripheric section, more curved than linear.	70%	22%	8%	3%	5%
Second	1867	Peripheric linear; early secondary discission of capsule.	86%	12%	2%	2%	
Third	1868	The same.	86%	9%	5%	3%	2%
Fourth and Fifth	1869 to 1876	Periph.-linear; removal of anterior capsule.	82%	7.5%	11.5%	8.5%	3%
Sixth	1876 to 1879	Periph.-linear; peripheral opening of capsule.	89%	1%	10%	8%	2%
Seventh	1879 to 1881	Section less peripheric.	88%	7%	5%	2%	3%
Eighth	1881 to 1882	Section circular-marginal; antisepsis in every other case.	90%	8%	2%	1%	1%
Ninth and Tenth	1882 to 1886	The same.	90.5%	5.5%	4%	3%	1%
1000 Cases	1866 to 1885	Gräfe's, variously modified.	85.4%	8.3%	6.3%	4.2%	2.1%

At the time of *the first series* the corneal tissue was believed to be much more predisposed to suppuration than the scleral. The section, therefore, was removed as far from the cornea as the anatomy of the parts would permit. The large flap of Jacobson and Graefe's linear section were both placed into the scleral border as close as possible to the insertion of the iris. In the first series of one hundred extractions, I favored Jacobson's section more than Graefe's. What was the result? The 10% or 12% of suppuration of the old flap were at once reduced to 3%; besides these the column of losses from all other causes was increased by 5% only. This compared

favorably enough with the results of the old flap operation, but we find 22% of moderate visual results. Plastic inflammation of the iris, capsule, ciliary body, and vitreous darkened the picture very materially. The accidents of the operation were very numerous, above all others there are noted 25% of prolapse of vitreous. This is not to be wondered at when we consider the very peripheric location of the section. I may mention, however, that 13% of the operations were done on complicated cataracts, and that complicated cataracts have been included in all my reports, with the exception of extensive detachment of the retina and traumatic cataracts where the injury to the globe, not the cataract, was the graver lesion. The peripheric location and consequent prolapse of vitreous frequently rendered the use of traction instruments necessary and prevented a thorough evacuation of the cataractous masses. Dense inflammatory obstructions of the pupil, iritic and cyclitic processes in inordinate number, were the essential features of the extraction by a very peripheric flap. Aware of this, I several times made the section less peripheric. Chance would have it that the one instance of corneal suppuration—and this was partial only—that occurred in this series, referred to a case in which the centre of the flap was situated in the transparent cornea. This seemed to be the immediate punishment for my sliding back into the previous vicious corneal section.

In the *second series* I practised Graefe's method without any deviation. Puncture and counterpuncture in the limbus conjunctivæ, centre of section approaching the transparent margin of the cornea by ½ to 1 *mm*, or closer still, but not encroaching on the cornea itself. The results were brilliant, only 2% of loss, and 12% of moderate success, instead of 22%. There was prolapse of vitreous in 18% of the cases. The two failures were by primary suppuration of the cornea. During the last quarter of this series I began to make early discission of pupillary obstructions. I stated that in doing so I followed the usage of the London Ophthalmic Hospital, but this statement was disavowed by Critchett and Bowman, who said that neither of them nor any one else, as far as they were aware, advocated

such practice. Whether my statement was a reminiscence or whether I erroneously believed it to be, I do not know at this day, but what I know is that it met with general opposition, and that in spite of this it has proved to be one of the greatest blessings I have ever hit upon in my operative pursuits. From that time up to this day, it has formed one of the well established, harmless, and beneficial procedures in my practice.

The *third series* was the work of one summer, my last in Heidelberg. With regard to its features, it was a repetition of the preceding series. I had learned to overcome the difficulties of the technique, so that eighty-nine operations were performed without an accident; among the eleven in which accidents occurred, were nine with prolapse of vitreous. There were three failures from suppuration, and two from plastic iridocyclitis. Besides these there were nine cases of moderate, *i.e.* imperfect results. In this series there was one case, and in the previous and the two subsequent series there were several cases of partial and transient *purulent capsulitis*, which did not destroy the vision, but dimmed the pupil more or less. Of this inflammation I shall say a few words hereafter.

The *fourth* and *fifth series* were distinguished, in the operative procedure, by a scrupulous endeavor to clear the pupillary area from all obstructions. The section was Graefe's peripheric linear, puncture and counter-puncture peripherally in the limbus, the centre touching the transparent margin of the cornea, at times remaining in the limbus, at others encroaching upon the cornea. The greatest pains were taken to wipe all remnants of cortex out of the pupil. The remnants were pushed toward the section with the lower lid and wiped out of the section with the edge of the upper, bacteriologically a reprehensible procedure. Whereas in the first three series I had ruptured the capsule extensively with a cystotome, in the fourth and fifth I endeavored to remove that part of capsule which corresponded to the natural and enlarged pupil. In the great majority of the cases, I succeeded in doing so. Then everything that was in the capsular bag was rubbed against the corneal section, and what could not be wiped away with the edge of the upper lid, remained between the lips of

the wound or slipped back into the anterior chamber, after having been in contact with the instruments, the edge of the upper lid, and the conjunctival secretion. The visual results in the cases that recovered without notable reaction, 82%, were excellent, but all kinds of wound-processes were noticed and carefully watched. They started mostly from the corners of the section following incarcerated shreds of capsule, or portions of iris, or particles of lens substance lodged between the lips of the wound. 7.5% of imperfect success and 11.5% of loss, among which 8.5% from suppuration, marked the path of these operations.

In the first third of the *sixth* series the same method showed the same deleterious reactions. Utterly dissatisfied with the results I decided to abandon the removal of a piece of anterior capsule and seek a procedure in which the operative traumatism and the necessary manipulation to expel the cataract were reduced to a minimum, and the wound was scrupulously kept clean, *i.e.* not only from external substances, but also from portions of lens, capsule, and iris. The peripheric linear section was continued, but the capsule was opened at the periphery only, by an incision parallel to the corneal section. In some cases a small vertical incision was added. There were still in this series 10% of failure, eight of which were from suppuration, but only 1% of imperfect result.

In the remaining *four* series the peripheric opening of the capsule was maintained, but the corneal section gradually shifted from the peripheric-linear of Von Graefe into the circular-marginal of De Wecker. This section, against my expectation, has proved as free from a tendency to suppuration as the peripheric-linear, and it has the advantage of being removed from the ciliary processes. The accidents during the operation were greatly reduced. Prolapse of vitreous occurred only exceptionally. In the *seventh* series there were 5% of loss, two from suppuration.

In the *eighth*, *ninth* and *tenth* series the operative procedure remained the same as in the seventh, but every other operation was done under *antiseptic precautions*. The room was sprayed with a 3%—5% solution of carbolic acid. The

patient's face and his hair near the eye were washed with a 2% solution, the eyelids and brow very carefully, the hands of the operator and assistants with a 3% solution. The conjunctival sac was washed out with solutions of boric acid, chloride of sodium or some other salt in a weak solution, one quarter of an hour or longer before the operation. In a few operations the instruments were placed in a 2% solution of carbolic acid, but I abandoned that precaution very soon, for it dulled the edge of the knife. Then the instruments were carefully cleansed with pure or slightly saline water and polished with a fresh soft linen towel. Before using them I always inspected them, especially the iris forceps, with a hand-magnifier. Wiping was done with sterilized sponges, kept apart and carefully disinfected. Borated cotton also was used for wiping the eye, as well as for dressing the wound. Over the borated cotton a layer of cotton moistened in a 2% solution of carbolic acid was placed, then borated cotton again, and an elastic flannel bandage. The padding was done with great care in order to secure immobility of the wound as much as possible. Later on the boric acid and chloride of sodium were replaced by a solution of corrosive sublimate 1 : 5000.

The *eighth* series, the best I ever had, showed 90% of good, eight of moderate result, and two failures. One of the failures referred to a complicated cataract, extracted under antiseptic precautions, in an unruly patient. Closure of the pupil by irido-cyclitis. The other was a hard cataract, with white, not totally opaque cortex. The clearing of the pupil required prolonged rubbing. The iris lying in one corner was stroked back, the conjunctiva which was pushed into the anterior chamber was brought out again with a probe. The eye was destroyed by primary suppuration, beginning in the first night. This case, operated in March, 1882, has always appeared to me as a type of inoculation of pyogenic germs by the excessive rubbing and handling of the wound. Antiseptics, which were not employed, *might* have saved that eye.

In the *ninth* and *tenth* series there were 90.5% of good and 5.5% of moderate results, but 4% of failures, of which three (six cases) were from suppuration. Among these six cases

four had been operated on with antiseptic precautions. One suffered from ozæna and chronic conjunctivitis; another from ozæna, chronic conjunctivitis, and lachrymal fistula; the third from chronic conjunctivitis alone; the fourth had lost one eye previously and was a mouth breather. Antiseptic precautions in all of them were very extensive. In the case of the fistula, the lids, surroundings of the eye and conjunctiva were washed with corrosive sublimate. The fistula was repeatedly syringed out with a stronger solution (1:2000), and after the operation iodoform powder was strewed on the opening of the fistula.

The case treated without antiseptics referred to a fat lady with healthy eyes, who was operated on at her house, on a blustering April afternoon. She was nervous and behaved badly during the operation; the removal of the lens and remnants of cortex required considerable manipulation, but was effected thoroughly and without accidents. Primary suppuration the same way as in the case mentioned in the eighth series.

The sixth case was lost $2\frac{1}{2}$ yrs. after a successful extraction ($V = \frac{2}{3}$ noted five months after operation). He had a small prolapse of iris. One day he exposed himself for hours to a cold rain and wind, the eye inflamed and "festered out."

In comparing the different series, it is somewhat surprising to see the results obtained by the same operator vary so considerably, *i.e.* from 2% of loss to 11.5%. Variations within certain limits will always occur on account of the different material we have to operate on. These limits in cataract extraction may lie between one and five or six per centum. Occasionally there may be a series of one hundred cases where no eye is lost, but this will be counterbalanced by another hundred in which a greater number of complicated cataracts or bad patients may show six or seven failures. Six per cent. of total loss constitutes the average obtained in large series of extraction with iridectomy. Arlt[1] had 5.67% of total failure in a series of 1075 cases; Rothmund[2] had 4.8% of S =

than at least one hundred cases should not be used as sufficient evidence in any proposition, for every operator has had series of from forty to seventy successive cases without a loss. When antisepsis began to be introduced into ophthalmic surgery, a distinguished operator found in the first series of cases primary suppuration reduced to 1% and a fraction, but when I asked him what was the average of his failures from all sources, he answered he was satisfied if it did not exceed 10%. This, at the present day, is too high a figure. But, gentlemen, every body knows in how different a way statistics are made. An excellent feature of some of our ophthalmic institutions, for instance the Massachusetts Charitable and the New York Eye and Ear Infirmary, is to publish a tabulated synopsis of their cataract extractions in their annual reports. This gives the informed reader a foundation upon which to base his own judgment, and besides it shows the work done by the institution in one of its most important departments. I would have adopted the same plan with the hospital of which I am the senior of the medical staff, if I had not published for many years the results of my cataract extractions in special journals with more detail than would be permissible in an annual report. In compiling statistics, not only the primary but also the final results should be mentioned as far as obtainable. To illustrate: one of the patients of my last series had $V = \frac{20}{20}$ for two years and a half, then his eye was destroyed by suppuration originating in a small angular prolapse of iris. I must not omit to mention one fact, for which there was no place in the statistical table, viz. *in two cases the loss of the fellow eye by sympathy.* I know that this affection after Graefe's extraction has been stated to be more frequent, but no other case among the one thousand under consideration has come to my knowledge.

The question of the occurrence of *suppurative processes* after cataract extraction could be discussed, by using the one thousand extractions under consideration, on the basis of many more examples than are mentioned in the above table, which gives only the *losses* from suppuration. In my special reports, where all the reactive processes are noted in detail, there are numerous cases of partial suppuration from which the eyes

recovered with more or less good sight. I beg to reserve for publication in the Archives of Ophthalmology the fuller statement of this very important point.

The general assertion that it is the merit of Graefe's extraction to have reduced the losses by suppuration from 10% or 12% to 5% or 6%, is exemplified also by our series of one thousand cases. I have, however, to protest against another assertion, viz. that suppuration after cataract operation always originates in the corneal section. Close observation of the patients under my care has shown that the suppuration may originate in any part of the extraction wound, in the cornea, iris, capsule, and also the vitreous when it is interfered with. The clinical proofs of this proposition are nowhere clearer than in the purulent capsulitis. I have repeatedly observed this disease in its purity during the first five hundred operations, when I was in the habit of extensively lacerating, or partially removing, the anterior capsule with the angular cystotome of Von Graefe. It is difficult to keep this instrument clean and sharp. In some cases a real pustule developed in the centre of the pupil, when the operation had been free from accident. The pupil fully dilated under atropine, its periphery was clear and sight tolerably good. That the circumscribed opacity in the centre contained pus was proven by the presence of hypopyon, for which no other source than the pustule could be found, for the cornea, iris, vitreous, and ciliary body were free from inflammation, and the hypopyon appeared and disappeared with the capsular pustule. In some of the cases where I had removed a part of the anterior capsule, the edge of the defect showed a circumscribed infiltration, which in some instances travelled along the edge.

To-day there is no more difficulty in explaining these cases than there is to explain those in which the occurrence of primary corneal suppuration startles the operator. If we believe that no suppuration occurs without the intervention of pyogenic germs, to which belief I have, much against my will, become a convert by clinical observation and a long series of experiments, we can easily understand that suppuration may originate in any point of a wound with which pyogenic germs

have been deposited, providing they meet there conditions favorable for their multiplication. These two factors, deposition of pyogenic germs and conditions favorable for their development, govern the fate of cataract patients. Before the bacterial origin of suppuration was known, clinical experience decided in favor of those procedures which shaped and located the traumatism in such a way as to render the conditions of suppuration least favorable. The *extent of the wound* was reduced as much as was compatible with the expulsion of the lens. *Bruising*, that fertile source of suppuration, was anxiously avoided, even with a sacrifice of a portion of the iris. The iris was easily bruised itself, and by occupying a certain space of the corneal section rendered the corneal wound more liable to be bruised. *Debris of tissue*, which in their decay furnished a favorable soil for bacterial growth, were carefully wiped out of the eye. The *section was removed* from the *irritable cornea* into the *indolent sclerotic*. In this way it was possible to produce even longer series of extraction, which, as our second and eighth, showed only 2% of loss from all sources. Is it surprising that a number of surgeons looked critically and with diffidence on the introduction of the antiseptic *means* used in general surgery,—not to be identified with antiseptic *precautions*,—into the operations of so delicate an organ as the eyeball? Conservatism has its limits, however, and to remain refractory against the application of such antiseptic means which the eye will tolerate, would, to-day, be an anachronism. To use measures tending to prevent the introduction of pyogenic germs, and if this cannot be done to its full extent, render, by sterilizing the soil, the development of germs difficult if not impossible, is the new departure in surgery. Owing to the success of these measures, the methods of operating for cataract are gradually changing. At present, we do not dread the cornea as we did, and, as a rule, we spare the iris. But, gentlemen, the leading principles and experiences of Graefe's time are not lost. Extraction with iridectomy will be, probably always, the operation of necessity in certain cases, and the safest to choose in others. As long as antisepsis is not an absolute guarantee of all unfavorable reactive processes, we

may fairly adhere to the principle, that, other things being equal, the recovery from any surgical interference will be so much more assured as the operation is simpler, cleaner, and smoother.

Let me, therefore, terminate this paper with an expression of thanks to the manes of a teacher of all and a personal friend of many of us, one of the most prominent of the disciples of A. Von Graefe, and one who did, perhaps, more than any one else for the introduction of sound antiseptic procedures into ophthalmic surgery; I mean the lately deceased Friedrich Horner. At the International Medical Congress held in London in 1881, he recommended the application of antisepsis in the extraction of cataract, but with the special injunction that every step of the operation must be performed with the utmost accuracy and delicacy.

A CASE OF AMAUROSIS AFTER THE ADMINISTRATION OF LARGE DOSES OF QUININE—RECOVERY.

BY D. B. ST. JOHN ROOSA, M.D.,
NEW YORK, N. Y.

ON the 18th of October, 1886, Miss L., of Savannah, Georgia, consulted me on account of blindness of which her family physician, Dr. Duncan, and her mother, gave the following history:

The patient is a tall, well developed young woman, a blonde, who resides in a part of Savannah which has a malarial character. While in Washington, D. C., in the summer, she had a well defined attack of intermittent fever, from which she recovered. Some six weeks since, while apparently well, she was seized with what, from the account of the family, was a convulsion. When Dr. D. and other physicians saw her, a

few moments later, she was entirely unconscious; she was breathing heavily and her pupils were dilated. The attack was believed to be a case of malarial coma, and the sulphate of quinine in 30 grain doses was administered by the rectum twice or three times. On the third day consciousness was restored, and she was found to be unable to distinguish light from darkness. The pupils were dilated, and the ocular conjunctiva was greatly congested. I have no account of an ophthalmoscopic examination. She slowly recovered a part of her vision, but for some time no improvement has occurred. She has been taking quinine and iodide of potassium; occasionally she has a chill, followed by fever. She cannot see to go alone, but with care she can distinguish large colored objects in her room, and with some hesitation, constantly moving her eyes as she does so. She can count fingers at 4′, but she cannot make out a letter.

Both optic papillæ are extremely white, and the lateral and oblique vessels are very small. The surface of the retina appears uneven, but no exudation is seen. She was given quinine three times a day, and the hypodermic injection of the sulphate of strychnia was begun. The chills soon ceased, her nutrition became excellent, and her vision gradually improved.

December 10. Miss L. has had daily hypodermic injections of strychnia since the 20th of October, in gradually increasing doses, the highest dose reached being $\frac{1}{2^{\frac{1}{5}}}$ of a grain, which produced physiological effects. This treatment was carried on by Dr. J. B. Emerson, and I saw the patient every few days, and made several examinations by the ophthalmoscope, as did Dr. Emerson. The vision, which was in the beginning eccentric, is now centric. She can see large objects at a distance and small objects when near at hand. Vision R. $\frac{20}{70}$, L. $\frac{20}{70}$. She reads No. 2 Jaeger with some fluency. She cannot distinguish green, but has no difficulty with red. The number of vessels seen on the optic papillæ has increased, but the papillæ are white and the vessels are small.

The patient then returned to Savannah, where she was under the care of Dr. Duncan. The hypodermic injections of

strychnia were continued for some weeks. On the 14th of May, she wrote to Dr. Emerson as follows:

"Since my return home my eye sight has improved wonderfully, and I am now delighted to say that I can see very nearly as well as I ever did."

In the early part of June I saw the young lady walking about the streets of New York, unattended, but I have had no opportunity for an ophthalmoscopic examination since December.

Whether the convulsion and coma from which this young lady suffered, were or were not due to malaria, as I think they were, there is no reasonable doubt but that she had well defined intermittent fever. Whether the amaurosis did or did not result from the injections of quinine must remain an open question. I think, in some respects, the case was a typical one of quinine amaurosis. The pale optic papillæ, the small and wanting vessels, the total blindness, the gradually increasing vision, are the group of symptoms which we now regard as typical of quinine amaurosis. The marked nystagmus, the eccentric vision, are however not characteristic of the cases previously reported. Finally, however, as will be noted, the vision became telescopic, as in the other cases. In the case that I observed from the start, and published in Knapp's Archives in 1879,[1] there was never any nystagmus, but the returning vision was centric to a degree.

When Dr. Emerson and I first saw our case, we were disposed to say that we were dealing with one of optic nerve atrophy, resulting from a descending optic neuritis. We gave a very guarded prognosis; but as the case went on, we became more and more sanguine, until the ultimate happy result was reached. How much the strychnia had to do with the recovery I am somewhat in doubt, but I am of the opinion that depleting treatment, such as would have occurred from the continued use of the iodide of potassium, would have been wrong. That the patient was a malarial subject does not admit of a doubt.

[1] Vol. VIII, p. [illegible].

DISCUSSION.

DR. GRUENING.—In the latter part of June, I saw a lady about fifty years of age, who lived in Hoboken. She had suffered from malaria, and had been given thirty grains of quinine. When she awoke the following morning she was blind and deaf. The deafness lasted until evening, and the sight returned the following morning. She was deaf twelve hours and absolutely blind twenty-four hours. I saw her five days after the attack. From her history I expected to find white papillæ, perhaps no visible or much contracted vessels. I found, however, a perfectly healthy fundus in both eyes. Central vision was normal, but the fields were much contracted, measuring not more than thirty degrees in any direction. This was certainly a case of temporary quinine amaurosis. There was absolute blindness and deafness following the ingestion of a large dose of quinine, then the deafness disappeared and subsequently the blindness passed away, central vision returned to the normal in a few days, with peripheric vision still wanting at the time of the examination, with a good color perception at that time but still an apparently perfect fundus in both eyes.

I should like to have this case recorded in our transactions, because as yet the lighter cases of quinine amaurosis have not been sufficiently studied. There are very few cases on record. It does not seem to be absolutely necessary that the ischæmia which has been described in the more severe cases of quinine amaurosis should be present in the lighter cases.

DR. HARLAN.—I have seen a number of cases in which hysterical patients presented pretty much the same condition as that described by Dr. Gruening. The contraction of the fields would excite suspicion. If nothing is discovered with the ophthalmoscope, there is a chance that hysteria may be the cause. Hysterical amblyopia may be associated with deafness, although I have not seen that combination.

DR. ROOSA.—I do not think that it has ever been established, at least to my satisfaction, that ischæmia is a primary lesion of quinine amaurosis, and therefore I am prepared to believe that the case of Dr. Gruening may have been dependent on quinine and not on hysteria. I have not been able in any of the cases to have an ophthalmoscopic examination by an expert immediately on the occurrence of the blindness. The experiments which I made some years ago and which were repeated in Berlin, on the ear, indicate that the opinion which I have already expressed, that the primary lesion is not ischæmia, but congestion, is the correct one.

CLINICAL CONTRIBUTIONS TO THE STUDY OF RING-SCOTOMA.

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FROM the relative paucity of reported cases, it might be inferred that ring-scotoma is either of very infrequent occurrence or is deemed of no special importance or interest by the practitioner; and yet I am inclined to believe that it will not be found of any exceeding rarity if it is searched for in the proper cases, and from my present point of view it is, for some considerations at least, of as much importance as the concentric or sector-like defects in the visual field for which we are on the *qui vive*, and to which we attach such diagnostic value.

Within the last three years two cases of ring-scotoma have come under my care, which I have been able to watch and examine at intervals for the space of two years. In most of the cases reported the results of a single examination only are given, and in none have the changes been noted for a length of time equal to mine; in fact, in but two or three instances is any account given of the subsequent history of the case after the first examination. I consider a knowledge of the progress of the affection to be of prime importance if we are to arrive at anything like a correct knowledge of its pathology or a proper appreciation of its significance as a symptom. All the authors who, in writing on the subject, have attempted to locate the lesion, have, I believe, placed it in the choroid, or at least within the globe. It has seemed to me, from a study of my two cases, and from the data furnished from other sources, that there is at least a warrant for questioning the accuracy of such a position, and for a reëxamination into the facts on which it is based. It is my belief that the phenomena can be more readily explained on the supposition of

a nerve or tract lesion. The basis of this belief can be better understood after a brief history of the two cases.

CASE I.—I saw Mr. J. S. O., a man of sixty years, for the first time on May 6th, 1885. On the 6th of the preceding January he had been attacked with an inflammation in the left eye, which had continued for some time. I found closure of the pupil from iritis. V. $= \frac{5}{60}$. Within the last few days there had appeared a cloudiness of vision in right, and it was for this that he now sought advice. Vision, as tested at that time, $= \frac{1}{15}$, and there was the usual picture of *choroiditis serosa*. The disk was veiled and there were some floating opacities in the vitreous. He denied having ever had syphilis, though he had gonorrhœa forty years ago; has had rheumatism off and on for several years. He was put on mercury and the iodides. He got on fairly well, his vision for the test-letters constantly improving, but yet he complained that he had the greatest difficulty in getting about.

On the 7th of June, though his V. $= \frac{4}{5}$, he had to be led to my office, because he could not see the curb-stones or other objects on the ground in front of him. I then examined his visual field for the first time and found it as recorded in Fig. I.

FIG. I.

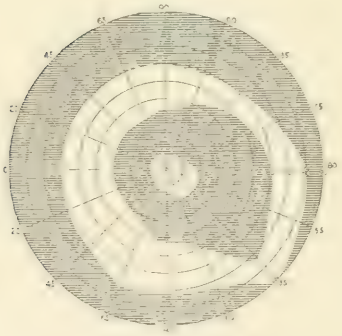
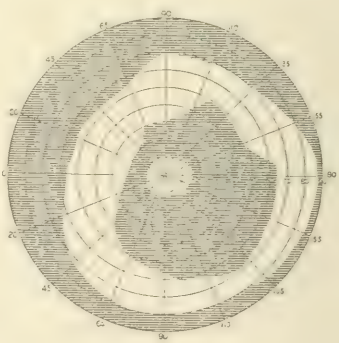


FIG. II.



The limits of the scotoma were sharply defined, particularly on the inner margin, which I consider accurate to within 3°. The outer limits cannot be relied upon for less than 5°. The ophthalmoscopic picture had not changed in any essential

particular. There were no gross changes in the region surrounding the macula to which the scotoma could be referred.

On the 10th of June, the form of the scotoma had changed to that given in Fig II. Central color perception, which was at that time examined, was good, and the visual field of the left eye was found to be free from any defect.

On the 27th of July, there was an attack of iritis in the right, which lasted three weeks, leaving V. = $\frac{4}{15}$ on the 15th of August, when the field, as represented in Fig. III., was taken. It will be noted that the ring is at this time broken, the central clear spot remaining as it has done from the beginning, essentially the same. There was no perceptible change in the appearance of the vitreous and choroid.

Fig. III.

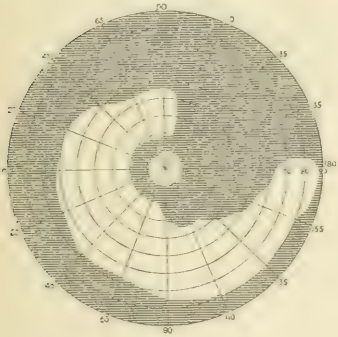
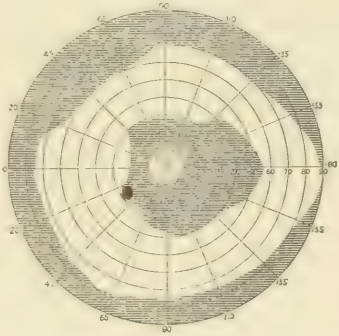


Fig. IV.



On the 31st of August, a change to that given in Fig. IV. was found, and V. had advanced to $\frac{4}{12}$.

On the 2d of December the ring had the form given in Fig. V., and distant V.= $\frac{4}{12}$. He was, however, able to read the newspaper, though not without difficulty, since he could not make out the whole of a very long word at once, and the passage from the ending of one line to the beginning of the next was difficult. A careful examination at this time failed to reveal any unusual changes in the choroid around the macula. There was no disturbance of the pigment, and it offered to view no alterations different from the remaining parts of the fundus.

The patient was seen no more until the 21st of March, 1887. The V. F. was then as given in Fig. VI. V. was not so good, being only $\frac{5}{36}$, but was increased to $\frac{4}{12}$ by -2.5. He was able, however, to read No. 2 of Wecker's scale without any glasses, and No. 1 with $+1$. In other words, within the last year a myopia had developed consequent upon a posterior stophyloma probably, a not at all uncommon occurrence in chronic choroiditis. Another careful examination, however, failed to discover any changes in the region corresponding to the ring to which it could be justly referred.

FIG. V.

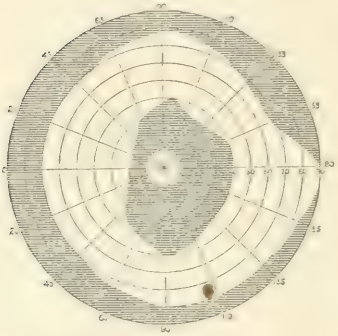
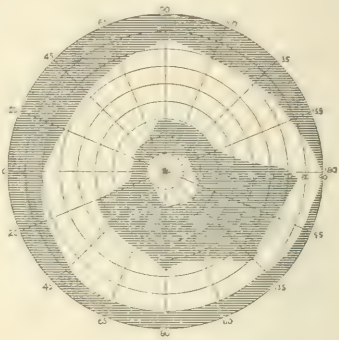


FIG. VI.



CASE II.—Mr. J. B. W., a man fifty-five years of age, consulted me for the first time on January 12th, 1884. He had been infected with syphilis two years before, and was treated soon after in Boston for some trouble with his eyes. Last September his V. became worse, and he was again examined there and his trouble pronounced cataracts, and he was told to wait until their maturation. His vision getting so bad while on a visit to Washington that he could scarcely get about alone, he came to me. I found V. $= \frac{4}{50}$ in both eyes, with no defect in color-perception. The ophthalmoscope showed turbidity of the vitreous, fine in left, but with one quite large mass of opacity in right. There were no changes in the choroid that were at all marked, and the retinal vessels were about normal in size and course. There were some slight iritic adhesions in left, and dots of pigment on the capsule in both; otherwise

the lenses were clear. His vision was very much worse at night, and there were some photopsias. An examination of the V. F. F. revealed a complete right hemianopic defect, with a perfect regular ring scotoma in the left field in right, and an irregular ring-scotoma in the left. (Figs. VII. and VII[a].) Put on mercurial inunction.

FIG. VII.

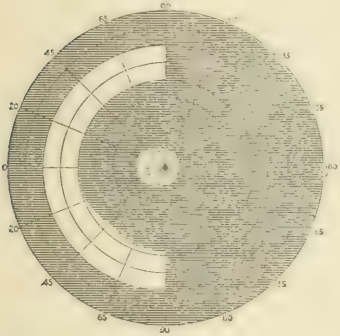
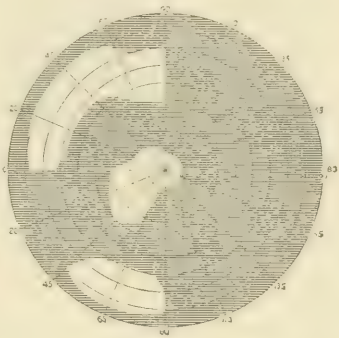


FIG VII[a].



January 29th. On the 25th inst. had very severe headache, and numb sensation on the left side of the body. V. = $\frac{4}{18}$. Vitreous seems a little clearer. In the right the whole of the left visual field is clear; in left there is complete right hemianopsia and a slight remainder of the ring extending into the left field. (Figs. VIII. and VIII[a].)

FIG. VIII.

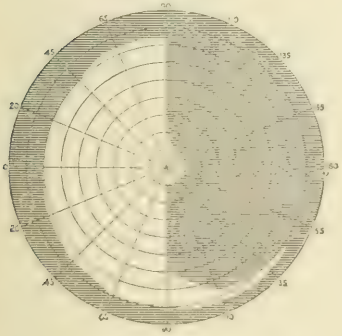
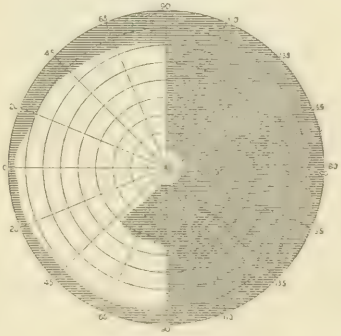


FIG. VIII[a].



On the 7th of February, the fields were as shown in Figs. IX. and IX[a]. The ophthalmoscopic picture had not changed. V. = $\frac{4}{18}$.

On the 25th of February, the dark regions were not absolutely dark, there being some sense of luminosity; their forms, however, remained essentially the same. V. = $\frac{4}{12}$.

FIG. IX.

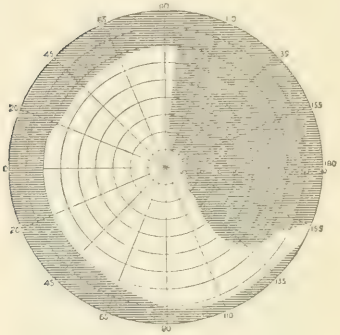
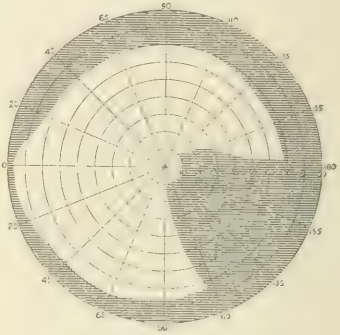


FIG. IX^a.



On the 11th of March, V. and V. F. F. were about the same. Can distinguish red, green and blue up to 10° from point of fixation, but not beyond. Vitreous seems to be clearing.

FIG. X.

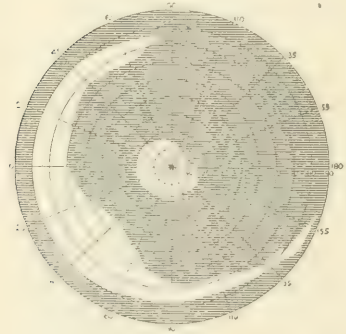
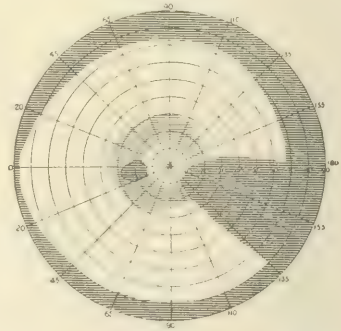


FIG. X^a.

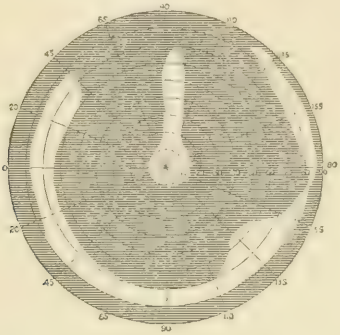


When he was next seen on the 24th of May, there was another change in the V. F. F. as shown in Figs. X. and X^a. In the right the ring had again made its appearance in the left field, while in the left there were only two complete defects in the field, a large pyramidal one downward and inward, and a small one just outward from the point of fixation. There

was, however, in addition to these, an annular space of diminished visual sensation, as shown in the shaded part of X^a.

In July both fields had improved, the left being almost clear, the right clearing in its lower outer portion. V. $= \frac{4}{5}$, centrally.

Fig. XI.



The patient was not seen again until January 22, 1885. In left V. $= \frac{4}{15}$, with a normal field of vision; right V. $= \frac{4}{36}$, with a field as shown in Fig. XI. There were some disturbances of the choroidal epithelium noted in the right at the inner side of the o. d.

Fig. XII.

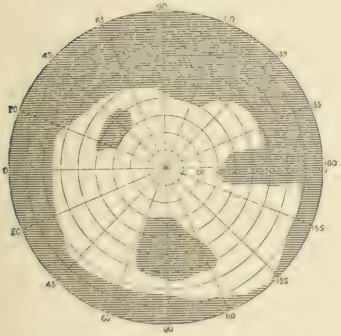
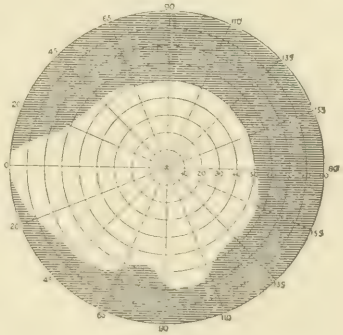


Fig. XII^a.



On the 14th of February the conditions were essentially the same, but while the visual field in the left was free to the perimeter test, there were spots where it was foggy, particularly in the lower portion. A drawing made at that time by

the patient himself, of his field in the right, corresponded closely with Fig. XI., and he stated that what was seen in the right was as if seen through frosted glass with numberless pin holes.

When seen for the last time on the 17th of November, 1885, the fields had the forms of Figs. XII. (R.) and XII[a]. (L.). V. $= \frac{4}{15}$ in right with -1.5, and the same in left with -0.75. The vitreous was clearer, and there were some marked disturbances of the choroidal epithelium downward and outward in the right, reaching nearly up to the macular region. There were also disturbances in the left upward and slightly inward, about six or eight disk diameters from the o. d.

The literature of ring-scotoma, at least so far as I have been able to hunt it up, is not abundant. The articles I have found bearing on the subject are given in the appended bibliography. The chief papers are those of von Graefe (2) (3), the discoverer of the condition; of Schoen (13), and of Hersing (4). The majority of the text books pass it by entirely or accord it only a mere mention. Noyes (8), however, gives three cases, all associated with *retinitis pigmentosa*, and Juler (6[a]) calls attention to our want of accurate knowledge concerning it, while recogizing its possible value as a symptom.

As remarked at the beginning of this paper, while there is no unanimity of opinion as to the precise seat of the lesion, the majority place it in the interior of the eye, and all of these, except Hersing, in the choroid, manifesting itself either as a choroiditis or as a part of the pathological processes in retinitis pigmentosa. The apparent cause for such a view is the fact that in a majority of the cases of ring-scotoma there is an associated choroidal affection, and the rather natural inference has been that they stood to each other in the relation of cause and effect. The great obstacle in the way of acceptance of such a view is the other fact mentioned by all, that in not a single case have the visible choroidal changes been found to coincide with the subjective defect. In one of our cases there were no determinable gross changes in the choroid, certainly not in the region corresponding to the scotoma, and in the

other the changes found were not in such a position as to cause the defect in the visual field. Some, particularly Schoen, endeavor to avoid the difficulty by assuming that there may be changes in the choroid affecting the retina which are not visible with the ophthalmoscope. This, it seems to me, is begging the question. Hersing assumes that in his case there was an infiltration in the retina which caused total blindness in the first instance, but which was eventually absorbed, leaving, however, a circular defect around the macula as a sequela.

On the other hand, Graefe, in his first case, evidently considered the lesion to be extra-ocular, and there are other cases, —that of Landolt's (9) among others,—in which there was no choroidal affection whatever, but, on the contrary, an implication of the nervous apparatus. I admit a possibility of the changes in the pathological process causing retinitis pigmentosa being such as to cause a concentric circular defect, because the law of concentricity seems to be almost invariable in the affection, and it might under some circumstances, not at present clearly understood, assume the form of a ring, but for the ordinary chroiditis it seems to me quite impossible that the exudation should stop sharply at a limit of 10° to 20° from the macula, leaving the centre of the field, as it is in some instances, absolutely intact. It seems much more natural for us to look to an affection of the conducting nerve fibres, rather than to disturbances in the recipient retinal elements as a cause of the anomaly, particularly in the light of our recently acquired more accurate knowledge of the manner in which the optic nerve fibres distribute themselves to the different parts of the retina and their pretty clearly demonstrated groupings and course in the tract, chiasma and nerve trunk.

We know now from the observations of Bunge (1), Samelsohn (12), Vossius (15), Leber (10) and others, that there is a certain group of fibres which go to the macular or papillomacular region of the retina, and that this group, while remaining intact as a whole, gradually changes its form and position relative to the other groups from the tract to the optic

disk. Those cases of central scotoma dependent upon circumscribed retrobulbar neuritis which have come to a post mortem examination, show an almost invariable course for these macular bundles as follows:—

In the tract they lie on the ventral edge and in the upper outer quadrant; in the chiasma at the floor of the recessus opticus; in the intracranial portion of the nerve pretty near the centre of the trunk; after they pass the foramen they gradually change their position, so that when they reach the point of entrance of the retinal vessels they lie on the temporal side, and at the entrance to the globe form the outer lower sector of the nerve trunk. (Vossius, 15.)

Bunge (1) has endeavored to show the manner of disposition of the different bundles of optic nerve fibres in the retina, and has been able to demonstrate a pretty clear division into: 1, papillo-macular, which is again subdivided into several sections; 2, the intermediate; and, 3, the peripheral.

These bundles seem to be quite distinct from each other, and they all change their positions relative to each other in their passage from the tracts forward.

The point of pathological and practical interest to be deduced from this anatomical arrangement is that in ring-scotoma we probably have the intermediate fibres affected by a circumscribed neuritis of the same nature as that which affects the macular fibres in the cases of central scotoma, leaving the peripheral and macular bundles intact; or it is possible that there may be pressure on these fibres where they lie on or near the surface, by an exudation or growth from some contiguous tissue. Our second case lends much plausibility to such a view. There was, at the beginning, a complete right hemianopsia, with left semi-annular scotoma. Evidently there was here, from some cause, a complete loss of transmitting power on the part of the left tract, with a concomitant implication of the intermediate fibres of the right tract. Only the most far-reaching imagination, I think, could conceive of such a condition being the result of choroidal disease. I would particularly direct attention to the character of the division line between the two halves of the field. It is identical with that

which is found in typical hemianopsia, due to tract lesion. It is strictly vertical, with a reëntrant angle at the point of fixation, leaving central vision intact. I cannot conceive it possible that anything but a nerve-fibre lesion could have caused such a peculiar visual field.

There is another circumstance which points most significantly in the same direction, and that is that the central, intact, field of vision is in size and shape almost, if not quite, the counterpart of the central scotoma in the cases of circumscribed retrobulbar neuritis. Bunge (1) finds that the papillo-macular bundles supply the central area of the retina for an oval space of approximately 20° in the horizontal direction and 10° in the vertical. In both of my cases the central clear field has about this size and shape. Unfortunately my attention was not directed to this point until both patients had passed from under observation, and my measurements, by the ordinary methods, cannot be relied upon for accuracy within 3°. A very careful examination of this clear central field, by more refined methods, would, I am sure, reveal a much closer resemblance between the two than even my diagrams show, and I hope that future observers will pay particular attention to this point in cases that offer for examination. It will be noticed, too, that in all the changes, some of them very marked, which the fields undergo, this central clear spot is never essentially reduced in size. It may become enlarged in some directions, but never concentrically, showing, I think, that these maculo-papillary fibres are never attacked as a whole by the pathological process, whatever it may be.

Bearing in the same general direction is the evidence furnished by the changing form of the field, particularly as manifested in my second case.

There was first a total right hemianopsia, with semi-annular defect in the left field. In sixteen days the semi-annular defect had disappeared, but the right hemianopsia remained, the ophthalmoscopic picture remaining essentially the same. The defect in the right fields contracted rather rapidly, so that, in a week, only the upper quadrant in the right and the lower quadrant in the left were affected. The defect in the left eye

went on from that time gradually narrowing until January, 1885, when it became essentially free; but up to that time there remained a small ring around the central clear spot about 15° broad, in which visual perception was much dimmed but not abolished. In May, 1884, there was an almost circular defect in the right, the ring being, however, much broader than at any previous time.

In January, 1885, it had changed its outer limit somewhat, and the central clear spot had enlarged into a vertical slit.

In November, 1885, the left field was free but somewhat narrowed, with slightly irregular outlines. The right eye at that time showed also an irregular contraction of the field, with two defects corresponding in position to the site of the former ring, representing, in fact, the remains of its breaking up. All these changes taking place without any visible change in the ophthalmoscopic picture, and in a somewhat regular and progressive order, can be accounted for, in my opinion, much more logically on the supposition of a varying pressure on the tracts, chiasma, or nerve trunks than by an exudation from the choroid.

That these annular defects can be due to affections of the nervous apparatus independent of any retinal or choroidal affection, is shown by Graefe's (2) first case and by Landolt's (9) case of double annular defect associated with lead poisoning.

I am fully aware, however, that, at present, we are not in a position to do much more than speculate on the pathology of the affection, and these cases, with the remarks thereon, I beg to be regarded, not as offering anything positive to the solution of the question, but rather as hints for future investigators and as pointing out a line of inquiry which I believe will be profitable.

BIBLIOGRAPHY.

1. BUNGE, PAUL.—Ueber Gesichtsfeld und Faserverlauf im [illegible] Leitungsapparat—Halle, Max Niemeyer. 1884. 4°. 30 pp.
2. GRAEFE, A.—Ueber die Untersuchung des Gesichtsfeldes bei amblyopischen Affectionen. Graefe's Archiv. B. II. 2. p. 274 et seq.

3. Graefe, A.—Excepti onelles Verhalten des Gesichtsfeldes bei Pigmententartung der Netzhaut. Graefe's Archiv. B. IV. 2. pp. 250 et seq.

4. Hersing.—Ringförmiger, concentrischer Gesichtsfelddefect. Graefe's Archiv. XVIII. 2. p. 69.

5. Hock, J.—Die syphilitischen Augenkrankheiten. Wiener Klinik. 1876. p. 108.

6. Imre, Josef.—Ein Fall von Ringskotom bei Chorioretinitis specifica. Zehender's Monatsbl. XIV. p. 267.

6ª. Juler, H. E.—A Handbook of Ophthalmic Science and Practice. Philadelphia, Lea Bros. & Co. 1887.

7. Nettleship, E. and Edmunds, W.—Two cases of typical amblyopia of slow progress, with central scotoma, in patients suffering from diabetes. Microscopical examination of the optic nerve in one case. Trans. of Oph. Soc. of the United Kingdon, Vol. I. p. 124.

8. Noyes, H. D.—Diseases of the Eye. Wm. Wood & Co. 1881. p. 295.

9. Landolt, E.—Troubles de la vision observés dans un cas d'hémiplégie saturnine. Ann. d'Ocul. Mars, Avril, 1880.

10. Leber, Theo.—Graefe u. Saemisch. Handbuch d. Augenheilk. B. V. p. 612.

11. Mooren.—Ophthalmiatrische Beobachtungen. 1867. p. 263.

12. Samelsohn, J.—Zur Anatomie und Nosologie der retrobulbären Neuritis (Amblyopia centralis). Graefe's Archiv. XXVIII. 1. p. 1.

13. Schoen, Wilhelm.—Die Lehre vom Gesichtsfelde und seinen Anomalien. Hirschwald, Berlin. 1874.

14. Uhthoff, W.—Untersuchungen über den Einfluss der chronischen Alkoholismus auf das menschliche Sehorgan. Graefe's Archiv. XXXIII. 1. p. 257.

15. Vossius, A.—Ein Fall von beiderseitigem centralem Scotom mit pathologisch-anatomischem Befund. (With full bibliography.) Graefe's Archiv. XXVIII. 3. p. 201.

16. Wilbrand, H.—Ueber Neuritis axialis. Zehend. Monatsbl. XVI. p. 505.

DISCUSSION.

DR. H. D. NOYES.—The record of cases in which ring-scotoma was connected with retinitis pigmentosa, led me many years ago to direct attention to this point, and in cases of retinitis pigmentosa it came to be my habit to always look for this lesion. I distinctly recall one case in the person of a physician which I observed during a period of years, in and which the ring-scotoma remained unchanged during the time of observation. There was no reduction in the concentric limitation of the field. This case impressed me with the idea that ring-scotoma might be looked upon as merely a local lesion.

Within two years, a case has come under observation in a young lady whom I treated many years ago for refractive error and asthenopic trouble. She is in delicate health, of consumptive parentage, and at the time of the last observation, seventeen years of age. She came complaining of pain with dimness of vision in one eye. With the ophthalmoscope, I could find no material lesion in that eye. When, however, I examined her with the perimeter, I found a ring-scotoma. Finding no local lesion, no symptoms of brain trouble, and no history or evidence of hysteria, I was led to search farther for an explanation of this symptom. I discovered what was to me satisfactory evidence of orbital neuritis. This consisted chiefly in the fact that pressure upon the globe elicited unquestionable evidences of pain. This was a feature of the case for at least two weeks. The patient remained under observation two months. The ring-scotoma was removed from the macula about 25°. This entirely disappeared and vision was perfectly restored. I have satisfied myself that ring-scotoma can be due to extra-ocular causes, and in this instance the lesion was to be found on the orbital portion of the optic nerve. Although these cases are rare, yet if one will search for them he will find that they are not so rare as has been thought.

DR. BULL.—A year ago I reported a case to the New York Ophthalmoscopical Society which may be classed in the same category as those of Dr. Burnett. The patient was a gentleman thirty-six years of age. When two years of age, he fell down stairs and received a severe blow, lacerating the soft parts of the temple and the external angle of the right orbit. Vision in the right eye was probably partially lost at that date, and a convergent squint developed which disappeared after two years.

The vision remained the same, counting fingers eccentrically at two feet.

In 1878, he received a compound fracture of the skull over the left parieto-occipital region, with depression of the bone. This was relieved by a trephining operation. Since then, he has been the subject of epileptiform convulsions of varying intensity and frequency, which have grown less marked during the past year. Of late, he has noticed that he could not see throughout a part of the field of the left eye. Examination shows that in the right eye he can count fingers at two feet eccentrically. In the left eye V. $= \frac{20}{20} +$ central. Accommodation was normal.

The ophthalmoscope showed in the right eye a chronic neuro-retinitis, and in the left eye a neuro-retinitis of low grade. The perimeter showed a normal field for 20° around the point of fixation, then an irregular defect in the field all the way round, varying in width from 15° to 20°. Outside of this, the field has the normal visual limitations in all directions. He is a good shot and has no trouble in reading, except that the eyes become easily tired. Refraction is emmetropic. I have seen this patient within the past two months, and the ring-scotoma remains precisely the same.

Dr. Knapp.—I remember a patient suffering from pigmentary retinitis, who afterwards became blind from glaucoma. Between the periphery and the centre he had a ring-shaped, not quite regular scotoma. Gradually excavation developed and he became blind. There was nothing in the ophthalmoscopic picture to account for the scotoma. The ordinary deposit of pigment, leaving free the macular region, showed no unusual feature corresponding to the ring. The other eye is the seat of retinitis pigmentosa, but there is no excavation and no scotoma of any kind, and very little limitation of the field.

Dr. Mittendorf.—I have seen a case of annular scotoma in an elderly gentleman suffering with partial atrophy of the optic nerve. The scotoma extended through from one-sixteenth to one-fifth of the field of vision. What I wish to emphasize is that in this case, likewise, no lesion of the retina or choroid could be found, except the partial atrophy of the optic nerve. Dr. Theo. Sachs has recently stated that in chronic glaucoma he has repeatedly found scotomata. I have examined five of my cases of glaucoma with this point in view, and I have found it in one, an old lady, who has a distinct peripheral annular scotoma. In this case, likewise, no lesion of the choroid could be found. I think that the opinion of the writer of the article above referred to, that not the choroid or

the retina, but the optic nerve is the seat of lesion, would explain the condition better than any thing else, especially in glaucoma, where there is such destruction of the nerve fibres.

DR. WADSWORTH.—A case which I published in 1884, in the Journal of Ophthalmology, seems to me to be very good evidence of the lesion being situated occasionally in the nerve. The affection involved only one eye and was traumatic, although not, I think, from direct injury to the organ. The patient was a young man, twenty-six years of age, who had been run over by a heavy wagon, one wheel passing over the chest. I saw him on the third day after the accident. There was then some haziness and a few hemorrhages of the retina of the right eye and central scotoma. In a few weeks all the ophthalmoscopic appearances cleared up, and the scotoma resolved itself into a ring-scotoma. There was a central spot, about two inches in diameter at fourteen feet, in which vision was perfect, $\frac{1}{10}$. Surrounding this was a zonular scotoma, seven to ten inches in width at a distance of fourteen feet. The outer boundary of the field was normal. There was absolutely no ophthalmoscopic change to be seen. This condition continued unchanged for several years at least.

PASSIVE MOTION IN THE TREATMENT OF PARALYSIS OF THE OCULAR MUSCLES.

BY CHARLES STEDMAN BULL, M.D.,

THE treatment of paralysis of the ocular muscles is, even under the most favorable circumstances, unsatisfactory, and the longer the muscles have been paralyzed the more unsatisfactory are the results of treatment, whether by internal medication, or external applications, or galvanism. Many cases of syphilitic paralysis improve up to a certain point, and then the improvement stops, and though the paralyzed muscle or muscles may have regained some of their motility, the annoying diplopia still remains. Other cases are not improved at all, in spite of all the methods of treatment at our disposal. Cases of rheumatic paralysis are even more obstinate in

resisting treatment, and it is in this class of cases, more than in any other, that the method of treatment first suggested by Michel in 1877, has proved in the writer's experience most useful. The influence of the galvanic current is most uncertain in producing the desired effects, mainly because it is in the nature of things almost impossible to localize or concentrate its action upon the paralyzed muscle, owing to a diffusion of a large part of the strength of the current through the overlying and surrounding tissues. By the ordinary method of application, one pole, usually a moist sponge, is placed over the closed lids, and the other pole is placed at the nape of the neck. Here a portion of the strength of the current does undoubtedly pass through the paralyzed muscle, but the greater part is diffused through the tissues of the lids and conjunctiva, and does not pass through the affected muscle. The same disadvantage attaches to the method advocated by De Wecker, in which the positive pole is placed over the supra-orbital or infra-orbital foramen, according to the position of the muscle involved, while the negative pole, an olive-shaped electrode, is passed over the eye, the lids being closed, in the direction of the paralyzed muscle. Direct stimulation of the muscular fibres, by means of a small electrode passed through an opening made in the conjunctiva and brought directly in contact with the muscle in its sheath, produces perhaps more contractility in the muscular fibres, but always causes considerable pain and sometimes great irritation and congestion at the point of contact. Hence this method of direct stimulation of the paralyzed muscle has been given up in favor of the indirect or reflex method.

In the Klinische Monatsblätter für Augenheilkunde for November, 1877, Prof. Michel proposed an orthopædic method of treatment of the paralyses of the ocular muscles, which was novel in conception, and offered theoretically certain advantages. It was based on the principle of passive motion, and was very simple in execution. The paralyzed muscle is to be seized at its line of sclerotic implantation with a pair of ordinary fixation forceps, and the eyeball is then to be pulled backward and forward in the direction of the line of contrac-

tion of the affected muscle as far as possible towards or even beyond the limit of contraction, and then back in the reverse direction, as far as the limit of extreme relaxation, and these to-and-fro movements are to be continued for about two minutes. According to *Michel*, the effect produced is greatest immediately after these manipulations, and sometimes the increase in contractility amounts to a millimetre and a half. The effect gradually diminishes until, in about an hour, it corresponds to a prism of 12° to 16° in strength.

Michel states that the pain produced was trifling, and that the induced conjunctival irritation soon subsided under cold applications. He recommended a daily performance of the manœuvre, and called attention to the considerable resistance at first offered to the manœuvre by the antagonistic muscle. The advantages claimed by *Michel* for this method were: 1, Elimination of the action of the antagonistic muscle. 2, The brief duration of the treatment.

Since the appearance of *Michel*'s article, the writer has tried this method of passive motion in a number of cases, and now gives the result of his experience in twenty-one (21) cases, as follows:

I.—*Paralysis of the External Rectus and Secondary Convergent Squint.* Mr. M. F., aged thirty-five. December 17, 1877. Has had homonymous diplopia for several weeks, and an examination shows paralysis of right external rectus and secondary contraction of internal rectus; also a rather marked weakness in action of both internal recti. Vision normal and fundus healthy. No history of either syphilitic infection or rheumatic tendency. Attributes the muscular paralysis to a severe cold. Internal administration of potassium iodide, and the application of the galvanic current three times a week, though persisted in, gave no result. Passive motion of the right externus daily for a minute and a half to two minutes, caused in *nine* days complete recovery. The pain caused was very severe, and the conjunctival irritation remained for several weeks after the last application.

II.—*Paralysis of the Internal Rectus.* Mrs. B., aged thirty-one. June 25, 1878. Crossed diplopia for some months. Al-

most complete paralysis of right internal rectus. Patient extremely rheumatic. Vision $\frac{20}{50}$ +. Media and fundus normal. Refraction myopic. No trouble with the eyes until the diplopia appeared. No history of syphilis. At first a mixture of sodium salicylate and potassium iodide, combined with the galvanic current, seemed to bring about a certain improvement, but after a few weeks this ceased, and the case remained at a standstill. Passive motion daily for a period of two minutes was then instituted, and an improvement began almost immediately. At the end of the twelfth session the diplopia had entirely disappeared, and the motility was apparently restored. This patient also complained greatly of the pain, and after several of the visits there was a distinct subconjunctival hemorrhage.

III.—*Paresis of Superior Rectus and External Rectus.* Miss H. S., aged seventeen. November 29, 1878. Two weeks ago was attacked with severe pain in right eye and orbit and right side of head, and after some hours diplopia appeared and still exists. Pain at irregular intervals. Is a tall, pale, anæmic girl, subject to rheumatism. Diplopia is homonymous and one image stands higher than the other. Vision and fundus normal. Examination showed paresis of right superior rectus and external rectus. The internal administration of tonics and the daily application of the galvanic current soon brought about a cure of the paresis of the superior rectus, but the paralysis of the external rectus remained. It was then decided to try passive motion, and the external rectus was pulled backward and forward daily for a period of one minute, which caused the patient such severe pain that after the fifth session it was deemed advisable to employ the manœuvre not oftener than every second day. This was kept up till the end of the second week, when it became necessary to stop it altogether, on account of the irritation and pain which it caused. Considerable motion, however, had been regained in the paralyzed muscle.

IV.—*Paresis of Inferior Rectus.* Mr. A. W. T., aged forty. October 7, 1880. Chancre fourteen months before, followed by cutaneous and glandular lesions, and mucous patches on tongue and in mouth and nose. Five weeks ago diplopia

appeared. Examination showed paresis of right inferior rectus muscle. Vision and fundus normal. Prolonged administration of mercury and potassium iodide, together with the application of the galvanic current, failed to produce the slightest effect on the paralyzed muscle. Passive motion was then instituted with daily sessions of two minutes, which proved very painful, but also almost at once brought about an improvement in the motility of the paralyzed muscle, and at the end of the tenth session the paralysis had disappeared.

V.—*Paresis of External Rectus.* Mr. F. D. S., aged thirty-two. December 3, 1880. Is rheumatic to a marked degree. Four months ago had a severe attack of rheumatism, the result of being exposed to a severe storm, and during the attack diplopia suddenly appeared. Examination showed paresis of right external rectus. Vision and fundus normal. Potassium iodide and sodium salicylate, with the galvanic current every second day, produced considerable amelioration in the paralysis, but after the first two weeks there was no further improvement, though the treatment was persisted in for a month. Daily passive motion was then instituted, and a further improvement began at once. After a month's treatment the motility of the eye seemed restored, though diplopia still existed at the extreme right of the field.

VI.—*Paralysis of Internal and External Rectus.* Mr. J. P. W., aged twenty-one. March 28, 1880. Has had for three years complete paralysis of left internal rectus, and partial paralysis of left external rectus. Origin unknown. Vision and fundus normal, refraction hypermetropic. Slight divergence of right eye. This patient had a long and faithful trial with the galvanic current and potassium iodide, and some improvement was produced in the motility of the external rectus, but the paralysis of the internal rectus remained complete. Passive motion of latter muscle was then begun and carried out daily for a month, but no improvement followed. This patient bore the manipulation extremely well.

VII.—*Paresis of External Rectus.* Mr. G. B. B., aged thirty-seven. April 23, 1881. Homonymous diplopia when looking to right of median line for several weeks. Partial para-

lysis of right external rectus. Subject to muscular rheumatism. Vision and fundus normal. No history of syphilis. Galvanism in this case proved absolutely useless, and there was no perceptible improvement from the administration of soda and potash. Three applications of passive motion on succeeding days produced a complete cure of the paresis and the disappearance of the diplopia. This patient complained greatly of the pain, and the conjunctiva remained congested for several weeks after the treatment ceased.

VIII.—*Paresis of Inferior Rectus.* Mr. J. R., aged forty-one. June 6, 1881. Chancre seven years ago; numerous constitutional symptoms since. Has had two attacks of diplopia before the present one, from both of which he entirely recovered, except that there still remains partial ptosis of right eye. Present attack of diplopia appeared one month ago, and examination shows paresis of right inferior rectus. Vision and fundus normal. The persistent administration of potassium iodide in rapidly increasing doses and the daily application of the galvanic current proved of no avail, and the application of passive motion daily for one month proved equally futile in bringing about any improvement in the diplopia.

IX.—*Paresis of Internal Rectus.* Mr. R. H. F., aged seventeen. February 20, 1883. Crossed diplopia for three months. Paresis of right internal rectus, traced directly to exposure for hours to severe cold. Vision and fundus normal. Has had some pain in right eye and orbit. Galvanism and hot applications caused a temporary improvement, but on the tenth day the condition was as bad as when the patient was first seen. Passive motion, however, acted extremely well in this case, and at the end of the seventh application the diplopia had entirely disappeared. This patient did not complain much of the pain.

X.—*Paresis of External Rectus.* Miss C. M. C., aged eighteen. Oct. 23, 1883. Has convergent squint in left eye, following paralysis of left external rectus, of nearly two years duration, which has remained unchanged in spite of all treatment. Vision $\frac{20}{30}$, and fundus healthy. This case was deemed a very unfavorable one from the beginning, owing to the length of

duration of the paralysis. There was a slight improvement in the muscular power of the external rectus during the first few sessions of the passive motion, but no subsequent improvement whatever; and after two weeks the treatment was finally discontinued.

XI.—*Paresis of External Rectus.* Mrs. J. T., aged forty-three. Nov. 30, 1883. Long subject to rheumatism. Two years ago had an alveolar abscess in upper jaw on right side, which opened both inwards and outwards through cheek. One month ago diplopia appeared. Examination shows paresis of left external rectus, and secondary contraction of left internal rectus. Vision and fundus normal. This patient had gone through a long course of anti-rheumatic treatment, including sulphur and other medicated baths, but the paralysis still remained. Eleven daily sessions of passive motion produced considerable improvement in the action of the external rectus, but the diplopia persisted even after the division of the internal rectus.

XII.—*Paralysis of External Rectus.* Miss M. K. J., aged thirty. Feb. 21, 1884. Diplopia and convergent squint in right eye, following paralysis of external rectus. Vision and fundus normal. No history of either rheumatism or syphilis. Galvanism proved of no avail, though employed for six weeks. The internal rectus muscle was then divided, and at the end of a week passive motion was begun, daily sessions of two minutes each being held. Improvement began at once, and after six applications the diplopia disappeared and did not return. There was a slight apparent divergence of the axes resulting, but no diplopia, and the internal rectus acted well.

XIII.—*Paresis of Internal Rectus.* Mr. E. J. B., aged twenty-four. Oct. 29, 1884. Had paralysis of right internal rectus nearly two years ago, with diplopia and secondary contraction of external rectus, from which he has partially recovered, but the diplopia is still annoying. Vision and fundus normal. Optic axes still divergent, but the right can be turned somewhat to the left of median line. Daily applications of passive motion for two minutes for two weeks produced a decided improvement in the power of the internal

rectus, so that double images appeared only on the extreme left. No further improvement, however, was perceptible after the end of the second week, and the treatment was stopped. A still further improvement would probably have resulted from tenotomy of the external rectus, but the patient declined all operative interference.

XIV.—*Paresis of both External Recti.* Mr. L. O., aged sixteen. March 7, 1885. Convergent squint appeared in both eyes some months ago, with annoying diplopia. Both external recti muscles are partially paralyzed. The attack was preceded by pain in the eyes and orbits. Vision normal. Fundus of both eyes seem abnormally hyperæmic. This was the first case in which cocaine was employed, and the very marked relief from the usual pain was a great advantage. Daily employment of passive motion was continued for three weeks, and produced marked improvement in the motility outwards of the left eye, and to a less degree in the right eye. But the diplopia still continued, though a much less annoying degree. There still remained a slight convergence in the right eye, but no further improvement was gained, and the treatment was given up. The galvanic current was subsequently employed every second day, and under its influence the right external rectus continued to improve in motility, but after three months slight diplopia still remained.

XV.—*Paralysis of External Rectus.* Mr. G. W. W., aged thirty. December 27, 1885. Chancre four years ago, followed by constitutional symptoms. One attack of iritis in right eye. Three months ago diplopia made its appearance and still remains. Complete paralysis of right external rectus. Vision and fundus normal. Slight convergence of right eye. Potassium iodide and mercury had previously been tried, but caused only slight temporary benefit. The potash was again essayed in large doses and pushed to toleration, but caused no appreciable improvement in the external rectus. Very decided improvement, however, followed the daily employment of passive motion for from two to three minutes, and continued for sixteen days. Here all improvement stopped, leaving still a loss of power in the externus of about

20°, and of course, a corresponding diplopia. Galvanism in this case proved useless, and cocaine did not entirely relieve the pain.

XVI.—*Paresis of Inferior Rectus.* Mr. H., aged forty-nine. March 17, 1886. Is rheumatic, but denies syphilis. Eight years ago had an attack of diplopia which lasted several months. Three years ago had paralysis of left arm, from which he entirely recovered. Three months ago had a second attack of diplopia, which still exists. Vision and fundus normal. Examination shows paresis of right inferior rectus. Galvanism and sodium salicylate in large doses produced some slight improvement. Passive motion under cocaine produced absolutely no effect whatever in increasing the power of the paralyzed muscle, or in diminishing the annoying diplopia.

XVII.—*Paresis of External Rectus.* Mr. A. F. W., aged thirty-five. Aril 11, 1886. Diplopia appeared originally three years ago from paralysis of external rectus of right eye, and secondary convergent squint. The paresis still present, though there has been considerable improvement. Fundus normal, refraction hypermetropic. Galvanism proved useless in this case, though faithfully carried out for six weeks. Passive motion under cocaine, employed daily, produced considerable improvement in the movements of external rectus during the first six sessions, but after this there was no further change, and the diplopia remained.

XVIII.—*Paralysis of External Rectus.* Mr. C. W. I., aged forty-eight. November 2, 1886. Long subject to rheumatism. Nine years ago, after severe attack of pain in right eye and orbit, diplopia appeared and has persisted ever since. Examination showed complete paralysis of right external rectus and secondary contraction of right internal rectus. Vision and fundus normal. Galvanism was tried faithfully, but failed to produce any effect. Passive motion daily under cocaine proved equally valueless, and after twelve applications the treatment was discontinued.

XIX.—*Paresis of External Rectus.* Mrs. T. P. K., aged thirty-five. December 7, 1886. For many years patient has not been able to turn her eyes to right side without seeing

double, and she habitually carries head to right side. Examination shows paresis of right external rectus. Refraction hypermetropic and astigmatic. Tenotomy of right internal rectus and daily employment of passive motion under cocaine produced no effect whatever in improving the power of the external rectus, and after sixteen daily applications all treatment was discontinued.

XX.—*Paralysis of External Rectus.* Miss S. T., aged 19, February 2, 1887. Ill-defined homonymous diplopia for two months. Examination shows complete paralysis of right external rectus, probably as result of exposure to cold. Both corneæ cloudy from old ulcerations in childhood, and vision somewhat defective. This patient had been treated continuously with potassium iodide and the galvanic current since the appearance of the diplopia, but without any result. Daily passive motion for two minutes under cocaine produced a complete cure in nine days. This patient complained greatly of pain.

XXI.—*Paralysis of Internal Rectus.* Mr. E. K., aged twenty-seven. March 18, 1887. Diplopia and divergent squint in right eye for more than a year. Examination shows paralysis of right internal rectus, and defective vision in right eye. Fundus normal and refraction slightly myopic. Seven daily applications of passive motion under cocaine, for two minutes each day, caused a disappearance of the diplopia and the return of the motility in the paralyzed muscle.

In considering the results of treatment by passive motion in these twenty-one cases, it will be seen that the paralysis was entirely cured in eight cases; partially relieved in six cases; while in seven cases the treatment proved valueless. This is certainly no brilliant showing, and yet the results are sufficiently favorable to make it advisable to continue our efforts in this direction. A more extended experience may perhaps teach us that passive motion in connection with the careful application of the galvanic current may give us better results than heretofore in the treatment of paralyses of the ocular muscles of long duration.

Michel reports in detail one case in which a recovery took place in five weeks. *Spalding* (Arch. of Ophthal., XV. 4) reports four cases, of which two recovered within three weeks, and two were failures. *Alt* (Amer. Jour. of Ophthal., April, 1887) reports five cases, of which three recovered and two proved failures.

The pain caused by the manipulation, when no anæsthetic is used, is in most cases severe, and is by no means entirely relieved by cocaine. The conjunctival irritation caused by the treatment is considerable, but usually transient. In several cases more or less extensive extravasation of blood took place beneath the conjunctiva, which, however, was readily absorbed. In three cases a rather pronounced œdema or chemosis of the conjunctiva followed the manipulation, but all these symptoms were transient in duration and limited to the region involved in the manœuvre. An attempt was made to substitute a pair of smooth pronged forceps, something like the ordinary epilation forceps, for the toothed fixation forceps, in order to diminish the pain and cause less laceration of the conjunctiva, but such forceps proved useless, as they failed to take hold of the muscles, and constantly slipped when traction was made.

A CASE OF RECURRENT PARALYSIS OF THE MOTOR OCULI.

By O. F. WADSWORTH, M.D.
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The case which I wish to report appears to belong to a class characterized by a very distinctly defined group of symptoms. At intervals varying in length both in the individual cases and in the same case, there occurs paralysis of all the branches of one oculo-motor nerve. The duration of the paralysis also varies. Always it is the same nerve that is affected, the other nerves remaining free. In most cases, possibly in all, the

attacks are preceded, or at least accompanied, by headache, confined to the corresponding side of the head, and chiefly localized in the frontal region.

Pauline and Frances, twins, were born of healthy parents, both of whom are still living and well. There were five children in the family, two older, three younger than the twins. With the exception of a girl, the second after the twins, who died at 11 months of "congestion of the brain," all were healthy. In June, 1874, when the twins were nearly three years old, both had scarlet fever, and both had a discharge from the ear. Both seemed to recover well and to be healthy for some time afterward, although in both a slight discharge from one ear continued, and Pauline had occasional headaches.

Although Frances is not the one whose case I present, it may be of interest to follow briefly her history, as it seems to have a bearing on the etiology of the other case. In Sept., 1877, when six years old, three years after the attack of scarlet fever, she began to complain of headache. The headache returned more frequently and was of longer duration till the following December, when she had a convulsion. Three weeks later convulsions recurred, and the attacks became more frequent until finally they occurred almost daily. About the middle of March, 1878, after a convulsion, she complained that she could not see. A week later, March 21st, she was admitted to the nervous department of the City Hospital. On the same day I found well marked optic neuritis and many white spots around the macula in both eyes. May 13th, Dr. J. Orne Green found the left membrana tympani much thickened and drawn in. She remained in hospital eleven weeks. The headaches and convulsions ceased, and the discs became atrophic. Sight did not return. I saw her again Feb. 24, 1879, in the out-patient department. She had had an occasional headache since leaving the hospital, but was otherwise, excepting her blindness, well, well-nourished, of good development, rosy-cheeked. She could only distinguish light from darkness. The pupils were large; the optic discs presented the appearance of atrophy following neuritis. Since that time I learn that she has been well, free from headache,

and has had no discharge from the ear. She is now a pupil at the Perkins Institution for the Blind, in South Boston.

Pauline, the subject of the oculo-motor paralysis, after the scarlatina in the summer of 1874, had attacks of headache every month or two; in the early part of 1878, headache for several hours each day during three weeks. The monthly or bi-monthly headaches continued, and on Feb. 24, 1879, being then seven years old, she was brought to the hospital, with her sister, having suffered from headache daily for two weeks. The headache was referred to the right supra-orbital region; was said to commence every day about noon, to intermit about 3, and to recur about 5 and then continue some four hours. There was vomiting on the first two days. Appetite impaired; dejections and micturition normal; tongue clean; general appearance good; a slight discharge from right ear; swollen glands behind each ascending ramus of jaw. Dr. Green examined the ears, but my notes state only that he found inspissated pus in the right. The right eye was quite normal, its refraction nearly emmetropic; the left eye highly myopic, with a regular crescent of $\frac{1}{3}$ to $\frac{1}{2}$ the diameter of the disc.

March 29, 1880, she was seen again. Meanwhile, headache every month or two, usually ushered in with vomiting, and lasting one to three days. When free from these attacks, she had appeared perfectly well. She was at this time suffering from headache which had lasted a week, the pain referred, as always, to the right supra-orbital region. There was vomiting at the beginning of the attack. She moaned in her sleep. Tongue clean; dejections regular; pulse 100; temp. 98.8°. Five or six days after this attack began, ptosis and divergence of the right eye was noticed.

There was paralysis of the right motor-oculi. In other respects the condition of the eyes as before. Dr. Green again examined the ears, but my notes only describe the condition he found in the left. Its membrana tympani was much drawn inwards and opaque from swelling, and there were several spots of ecchymosis. Its hearing was very fair.

At the end of February, 1887, Pauline came again to the

hospital. She was now 15, well grown, and apparently healthy. Her headaches had diminished in frequency; for the last few years she had had three or four each year, lasting from one day to two weeks, the more severe ones being accompanied by complete ptosis of the right eye and dilatation of the pupil. She had noticed no diplopia at these times, and no special change in the position of the eyeball. She stated that the ptosis and dilated pupil always continued till the headache was over, and then gradually passed off, so that at the end of a week or ten days they had entirely disappeared. The latter statement was probably incorrect, and I shall refer to it again.. She had just recovered from a headache of two weeks' duration, accompanied by vomiting. There was a moderate amount of ptosis of the right eye, and nearly complete paralysis of all the other muscles, external and internal, innervated by the right motor oculi. Moderate divergence. The external rectus and superior oblique acted normally. Fundus of both eyes as before. She was seen again twice, at intervals of two or three days.

March 4th, there was a little more movement of the eye inward, upward, and downward; a little more action of the pupil and of the ciliary muscle. R. V. = $\frac{25}{200}$. L., with —14 D., V. = $\frac{20}{70}$. Field normal. She promised to come again, but did not.

April 24th, I visited her at her home. There was still a slight droop of the right upper eyelid, decided impairment of movement of eye upward, moderate impairment of movement downward, and inward. The pupil did not react fully, and power of accommodation was imperfect for her age. She was, however, conscious of no defect of motion in the eye, nor aware that the pupil was affected. This was eight weeks after cessation of the headache, and it is probable, therefore, that previous paralyses had not passed off completely, as she had stated, especially as her father had observed that her eyes usually appeared not quite straight. That she should never have been troubled by diplopia is not surprising in consideration of the great myopia and imperfect vision of the other eye.

I was unable to see the mother, who was away at the time

of my visit, but the father was positive that the attacks had diminished in frequency of late years, the last severe one having been in the previous July, an interval of seven months. Another fact of much interest I first learned from him, that with each severe attack, toward the end of the period of headache, there was a free discharge of ill-smelling fluid from the right ear, staining the pillow, and requiring syringing for some days. At my request and representation of the importance of treatment of the ear, she visited Dr. Green on May 6th. He found a large polypus completely filling the right meatus and removed it, but after two or three visits she ceased attendance.

These cases apparently occur but rarely. I have found but fifteen reported,[1] with one exception already collected by Mauthner, although very possibly some publications during the last year have escaped my search. And of these fifteen several are very meagrely reported, two in such a way that it seems by no means certain that they properly belong to this category. On the other hand, with one exception, reported by Gubler in 1860 (Mauthner has recently published notes of a case seen in von Graefe's Clinic in 1864), the earliest observation published was in 1882, so that it is probable that the number of reported cases will increase considerably in the immediate future.

The sex is not mentioned in one of the doubtful cases; of the remaining fifteen, including mine, four were males, eleven females.

In the two cases I have regarded as doubtful the side is not given; of the other fourteen, in seven the right, in seven the left motor-oculi was affected.

The age at which the paralysis first appeared is not given in three cases, including the two doubtful ones; in one it occurred at eleven months, in one at eighteen months; the latest date, with one exception, is fourteen or fifteen years. The exception is a case briefly referred to by Buzzard,[2] a

[1] Since this case was read a case has been reported by Hinde and Moyer in the New York Medical Record, Sept. 24, 1887.

[2] Clinical Lectures on Diseases of the Nervous System, p. 164.

woman of thirty, "subject for years to paroxysms of facial tic; recurring about every fortnight, and concentrated more or less definitely in the ophthalmic division of the fifth nerve." Within the last year or two each attack had been followed by partial paralysis of the oculo-motor, the paralytic condition lasting for a few days, One of the attacks he observed.

The varying length of the intervals between the attacks has already been noticed. In the case just cited it was shortest—two weeks. In von Hasner's case the attacks recurred every month, and although preceding by two years the establishment of the catamenia, after their appearance were coincident with them. In most cases the interval was not a regular one, and lasted from a few months to a year. In Gubler's case there were two intervals of three years, then one of sixteen years before the last attack, which was followed a fortnight after its commencement by death.

The period of headache varied, even in the same patient, in one case from one day to several weeks. And a similar difference appeared in the duration of the paralysis. Although the patients often are said to have stated, as in my case, that the paralysis passed off completely in the intervals, there is, I believe, in no case the definite statement that its entire disappearance was observed by the reporter. On the other hand, in several instances, evident remains of the paralysis were observed to persist between the attacks.

With four exceptions, it is distinctly stated that pain resembling megrim accompanied the attacks. Of the exceptions, Gubler's patient was seen only some days after the paralysis was established; the case is reported very briefly, but it is said that the man had all his life been subject to violent attacks of megrim. Weiss's case is also very briefly reported (the patient was of little intelligence and unfamiliar with the German language); nothing is said of pain. The other two are the cases classed as doubtful. These were reported in a discussion which followed a report of a case by Snell.[1] In one, by Ormerod, it is not clear that there were ever more than

[1] Lancet, I. 938, 1885.

two attacks; the patient was an elderly woman; the Argyll Robertson symptom was present, but the knee jerk not wanting. It is stated that there was pain in the region of the supra-orbital nerve, but nothing to suggest megrim. Of the other, by Beevor, we learn only that he "had seen a similar instance in which exposure to cold winds were (*sic*) assigned as the cause." Perhaps both these cases had better have been omitted from the list.

Only in one case, that of Thomsen, was there observed contraction of the field of vision during the attack, and here the concentric contraction was found in both eyes, although of much less amount in the eye free from paralysis. This case was complicated by epilepsy. The man was thirty-four years old; the recurrent paralysis began at the age of five; the epilepsy first appeared at thirteen years, and followed directly a fall from a ladder which produced temporary unconsciousness.

The course of the disease is extremely variable. In some cases the duration of the paralysis and the intervals between the attacks seem to have continued the same; in some the attacks became more, in others less severe; in some again the periods of freedom became longer, in others shorter. There is no instance of permanent relief, perhaps because the time of observation was not sufficiently prolonged. Three cases terminated in death.

Different interpretations of the cause of the affection have been given. Some have considered it a purely functional disturbance, analogous to ordinary migraine. Others have supposed a tumor or inflammatory process at the nucleus of the nerve. Others again a pachy- or lepto-meningitis, an anomaly of the vessels, or a tumor at the base.

It seems to me very difficult to admit the theory of a purely functional disturbance, especially in view of the partial persistence of the paralysis noted in several cases between the attacks. There are also difficulties in the way of an assumption of a disease-process at the nucleus, lasting for many years, extensive enough to involve all branches of the nerve, subject to frequent exacerbations, and yet never affecting any

other nerves, either of the same or opposite side. A basal origin appears more probable.

The results of autopsy in the three fatal cases also point to the base as the seat of the trouble. Gubler's patient died after a short illness with delirium running into coma. A plastic exudation surrounded the right motor oculi. There were other lesions, but this was the one which seemed best to explain the paralysis.

Weiss's patient died of tuberculosis of the lungs. The right motor oculi was flattened, gray, and showed a tubercular enlargement at the point where it issued from the crus cerebri. The granulations did not extend into the brain substance.

Thomsen's case passed from his observation and died about a year later of gangrene of the lungs. The end of the case was reported by Richter. There was a fibro-chondroma of the right motor oculi, which doubled its size, but had developed in such a way as to separate the nerve fibres without destroying them.

In my own case the history points pretty distinctly to a direct connection between the aural disease and the paralysis of the third nerve. There can scarcely be a doubt that a meningitis was set up by the aural disease in the twin sister. It seems here not unreasonable to suppose an exudation or thickening over a limited portion of the dura, which makes pressure on the motor oculi whenever a re-excitation of inflammation in the ear with retention of pus induces an increased vascularity or swelling. And when it is remembered that the third nerve penetrates the dura some little distance farther forward than the fourth and sixth, it is seen that such a limited thickening might readily be situated so as to affect the third nerve alone.

DISCUSSION.

Dr. Roosa.—Since the meeting of the Society, Dr. Daniel R. Ambrose, of New London, with whom I saw the case in consultation, has taken great pains to secure for publication a complete history of the case of recurrent paralysis of the third nerve, to which I referred in the discussion upon Dr.

Wadsworth's paper. I avail myself of the permission of the Society to have the case fully reported in the Transactions.

J. S. K., aged thirty-two years, came under my observation in 1874, with symptoms of paralysis of third nerve of left eye, viz., ptosis palpebræ, dilated pupil, external strabismus, and inability to move the eye in any direction except outwardly.

His history was as follows: At about the age of eight years, while going to school, without any known predisposing or exciting cause, he was first attacked with headache on Sunday, and it lasted until the afternoon of the following Monday, when he again felt quite well and went out doors to play. This headache returned on several successive Sundays and continued until the afternoons of the following Mondays, and this circumstance caused his parents to believe that the headache was feigned in order that he might keep away from school on Mondays. At first his parents did not notice any change in the appearance of the eye, but later on they discovered that the upper lid drooped and the eye turned outward; then the family physician was called in, and he spoke of it as a trivial matter which would in time wear away or be outgrown. At first, in a few days after each attack the lid and eye would resume their natural position; but after awhile they gradually failed to become restored, and at the expiration of five or six years they became fixed in their abnormal positions. These headaches came at various intervals of one, two, three, and four weeks.

Careful inquiries elicited no history of specific disease either hereditary or acquired. At the time he first came under my observation, and during the ten years following, the most marked symptoms during an attack were as follows:—1st, a dull heavy feeling, followed in a few hours by—2d, a sharp sickening pain, not at the supraorbital foramen and upward along the course of the supraorbital nerve, as is so common in hemicranial headaches and deep acute inflammatory affections of the eye, but at a point on upper lid of left eye, just over the inner margin of the cornea, and therefore probably involving one of the palpebral filaments of the supraorbital nerve; and thence, as he described it, extending directly backward to the centre of the brain and causing vomiting at the beginning of each attack, which would be followed by a nervous chill. 3d, the intensity of the pain in the latter part of each attack would change to the point where the trapezius muscle is pierced by the left great occipital nerve. 4th, during the last three years he has had very little pain about the eye or the occiput; the greatest amount of pain, and in fact all that he has complained of, has been located over the left parietal bone

just above the parietal eminence, which becomes so cold that he has to apply a bag of hot water to it. 5th, about five or six years ago the vomiting at the beginning of each attack gradually became less, and for awhile was superseded by a tenacious frothy sputa which he called "cotton spittle." 6th, for a period of nearly two years he was troubled during the paroxysms with a twitching pain down the right arm and leg, which was more severe in the leg along the course of the great sciatic nerve.

At various times this patient was seen in consultation by Drs. O. D. Pomeroy, D. B. St. John Roosa, C. R. Agnew, E. G. Loring, William A. Hammond, and Brown-Sequard. The treatment of this case has from time to time been the administration of tonics with cod liver oil and iron, quinine and Fowler's solution of arsenic, iodide of potassium, bichloride of mercury, sulphate of strychnia and aconitine during the intervals; and bromide of potassium and sulphate of morphia during the paroxysms of pain.

Quinine has been given just before the expected attack in doses varying from five to sixty grains, without any apparent benefit, and without causing any disturbance of his head or ears. Fowler's solution has been given in gradually increasing doses, without any perceptible benefit. Bichloride of mercury one sixteenth of a grain three times a day was given, and at same time iodide of potassium in doses increasing from fifteen grains to one hundred and eighty grains per day, with negative results. Aconitine (Morson's) was given for fifteen days during intervals, commencing with $\frac{1}{100}$ of a grain in water three times a day after meals, and then increased to $\frac{1}{120}$ and to $\frac{1}{100}$ of a grain, but it likewise failed.

During the paroxysms bromide of potassium was given in doses from ten to forty grains, with a view to relieve pain and procure sleep, but without any effect. The following prescription, viz.: atropiæ sulph. gr. $\frac{1}{40}$, morphiæ sulph. gr. $\frac{1}{2}$, strychniæ sulph. gr. $\frac{1}{30}$, was administered hypodermically night and morning during the paroxysm, and it did some good, but not as much as one-third of a grain of morphine alone hypodermically every eight hours had given. Atropine gelatine discs (Savory & Moore) were dropped in eye night and morning during the intervals, and an ointment composed of veratrine gr. iii. and ungt. simpl. ʒi. applied externally over supraorbital nerve, but no benefit was derived from them.

Acupuncture by passing needles between the skin and bone just over the eyebrow, and the application of iron heated to whiteness over the course of the supraorbital nerve, were also recommended, but the patient had become so disgusted

at the failure of all treatment that he would not submit to either of these last two measures. So he had finally to fall back on the first remedy, morphine administered subcutaneously at intervals of about eight hours during the pain, with which he has for the last two years or more been treating himself.

The average duration of a paroxysm all these years has been about thirty-six hours. The attacks now come on at varying periods of three, four, five, and six weeks, but the average time is four weeks.

With the exception of the left eye he is, in appearance, a model of good health, and is to-day more robust than at any time during the last thirteen years that I have known him.

His vision in right is $\frac{20}{30}$; and with + 60 c., ax. 90, = $\frac{20}{20}$. Vision in lefteye is $\frac{20}{70}$, not improved by any glass, but with the aid of stenopäic slit is $\frac{20}{50}$ dimly. The media are perfectly clear except a small opacity, about the size of the diameter of the shaft of an ordinary pin, on the posterior capsule, about midway between centre and inner margin of lens. There are no pathological changes in the retina, choroid, or optic nerve perceptible with the ophthalmoscope.

The upper lid droops more now (Oct. 1887) than I have ever before seen it, covering about two thirds of the cornea, and falling nearly to the lower margin of the dilated pupil.

CASES OF PRIMARY ACUTE GLAUCOMA, OF PRIMARY HÆMORRHAGIC GLAUCOMA, AND OF SECONDARY GLAUCOMA, WITH REMARKS AND PHOTO-MICROGRAPHS.

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Primary Acute Glaucoma.

FEBRUARY 2, 1883, M. H., a married woman aged fifty-two years, suffering from an attack of acute glaucoma in the left eye, presented herself at the Wills' Eye Hospital. She stated that the attack had lasted twelve days, coming on during a period of mental worry and while at sea, two days

after having embarked for this country. She noticed that the eye first became "cloudy, as if something were in front of it which ought to be wiped away," followed the next day by an intense pain, which continued during the whole subsequent ten days passage, preventing her from eating and sleeping properly. The lids were slightly swollen and their veins full, whilst the lining conjunctiva was of a dull red tint. The cornea was hazy and "needle-stuck," with marked ciliary congestion around its entire periphery. The anterior chamber was very shallow, and the pupil was irregularly dilated, with a slight synechia above and to the inside. Intra-ocular tension was much increased (T + 2), and the eyeball felt quite hard to the touch. The patient complained of intense intra-ocular, temporal and frontal pain. The vision in this eye was so impaired that she could only count fingers at two and a half feet.

The patient further stated that on the 5th of August, 1875, soon after a moderate dinner, at which she had partaken of plain food only, without stimulants of any kind, a severe attack of pain and inflammation occurred in the right eye, and that the sight rapidly failed while the ball became stony hard. She had noticed no previous fogging of the sight, and had been reading for some hours in the same morning. An iridectomy had been performed after the above attack, and the eye had remained quiet ever since. Examination showed that there was a narrow iridectomy upward, the centre of the cicatrix of the incision being in the limbus and each side encroaching upon the clear cornea; while just a little to the outside of the centre, there was a slight cystoid clavus or impalement of the iris in the wound. The eye was quiet and tension normal, the ophthalmoscope showing a small optic disk, slightly grayish in tint and *not excavated*—eyeground fairly healthy with a hypermetropia of three dioptrics.

Owing to the patient's extreme feebleness and exhaustion, no operation was at the time attempted on the inflamed eye, but she was admitted to the hospital, put at rest in bed and given good nourishing diet, while a Heurteloup leech was applied to the temple and eserine repeatedly instilled into the eye. Under this treatment, in two days the cornea became

less "steamy" and the eye less congested. On the fourth day the pain had so far subsided that the patient could sleep at night without an anodyne. The pupil, in spite of the eserine, was still irregularly ovoid, with its axis at eighty degrees, but vision had so far improved that with a plus one-eighth spherical lens, the patient could see $\frac{20}{200}$. Sixteen days after admission to the hospital (twenty-eight days after the commencement of the attack), the eye still remaining as above described, an iridectomy upwards and slightly inwards was made with a lance-shaped knife, and a large piece of iris removed with a single upward snip of the scissors. Twenty-four days after the operation, it is noted that the wound was firmly healed, but the cornea was still so cloudy that only a misty view could be had of the fundus; the vertical vessels being best seen with + s. 3. D. Two days later the patient was discharged, and told to use a weak solution of eserine. Two days after leaving the hospital, she returned with a sharp attack of catarrhal conjunctivitis in each eye; this yielded to weak astringents, and the eye became clear and quiet.

On the 18th of April (sixty-eight days after the operation), the patient again presented herself at the hospital, and could read Sn. 1½ at thirteen inches with + $\frac{1}{6}$ *sph.* ⌒ + $\frac{1}{36}$ *cyl. ax.* 165°. The eye, however, never became quiet, the patient returning at intervals with attacks of blepharitis and conjunctivitis until August 6th, 1884 (nearly a year and a half after the operation of iridectomy), when she had a sharp attack of pain which was not relieved by eserine. Two days subsequently a sclerotomy downwards was performed: this was done without the use of an anæsthetic. Nervous shock with chills down the back followed the operation, though there was no pain in the eye.

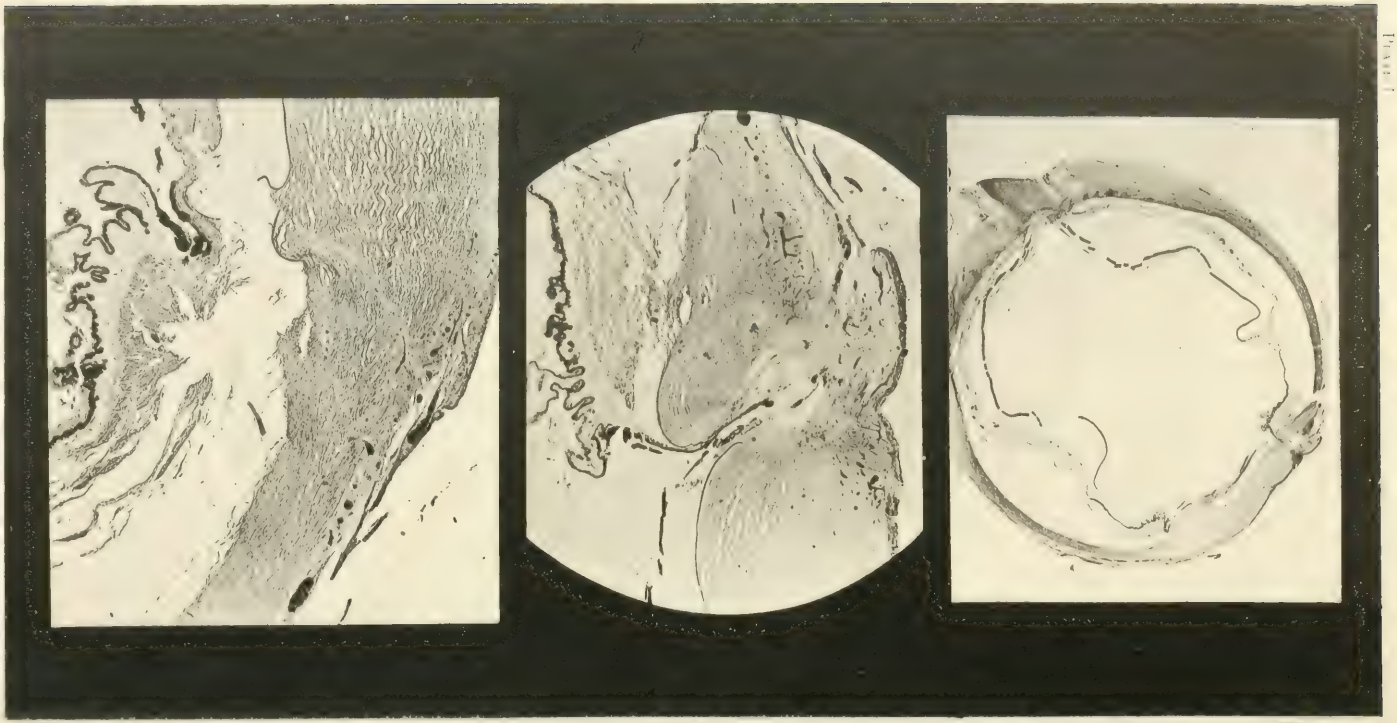
In November the eye was still unquiet and a cystoid cicatrix which had formed was becoming more prominent and bulging. At this time a stye formed at the outer angle of the lower lid, which suppurated by the use of hot stupes.

In April, 1885, there was a fresh attack of inflammation of the eye with hypopyon; this disappeared in a few days, leaving the eye still irritable and the anterior chamber obliterated except just opposite the iridectomy.

Fig. 3. Sclerotomy, M. H. x18.

Fig. 2. Iridectomy, M. H. x16.

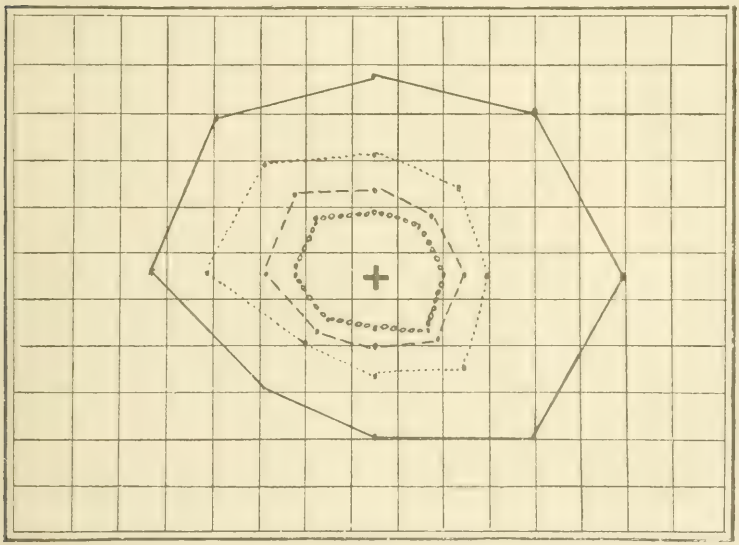
Fig. 1. Section of Globe, M. H. x8.



On the 16th of April, 1885, the eyeball was enucleated under ether, without accident, and the wound healed rapidly.

Except that the patient has occasional attacks of eczema on the back of the wrists, there is no evidence of nerve-disease or constitutional dyscrasia, and the right eye (July, 1887) still remains quiet and serviceable, giving a vision of $\frac{20}{30}$ with correcting glass and having a good field of vision, which is herewith appended.

The photomicrograph now projected upon the screen (Vide Fig. 1, Plate 1), shows a section of the enucleated eye. It exhibits a cystoid cicatrix on the side of the iridectomy, and shows the corneal lamellæ separated and its tissue loosened throughout, especially in the neighborhood of the cicatrices of incision. On the side opposite the iridectomy is seen a cut in



EXPLANATION.

This field has been reduced to one-twelfth of its original size. It was obtained by the carrying inwards on a large ruled black-board, of a centimetre square of unglazed white or colored paper on a dead-black card; the patient being placed at about twenty-five centimetres distance from the fixation point, which consisted of a small white cross. The outer ruled lines represent the furthermost boundaries of the white field; the dotted lines bound the yellow area; the stroked lines designate the outer boundaries of the blue field; whilst the ringed lines give the limits of the red field.

the membrane of Descemet, and the cicatrix of the sclerotomy leading outward and downward from it The remnants of the hypopyon are visible as a band of fibrillated and nucleated tissue at the bottom of the anterior chamber adjoining the sclerotomy scar. The choroid is thickened and its blood-vessels dilated; the larger trunks where they approach the vortex, being filled with blood. At the optic entrance, the nerve fibres in the head of the nerve have shrunk, and have been pulled away from the concave lamina cribrosa by the drag of the cutting knife. We have thus a specimen of glaucoma before the formation of an excavation, and while the softening atrophic changes in the head of the nerve, which make it so readily give way to intra-ocular pressure, are taking place. More highly magnified sections[1] show these processes in detail. The ciliary nerves where they pierce the sclerotic have an increase of the fibrous tissue envelope around and between the fibres, with proliferation of their nuclei; perhaps this is preparatory to the atrophy which has often been found in the ciliary nerves of complete glaucoma.

Primary Hæmorrhagic Glaucoma.

MISS E. B., aged seventy, applied for treatment at the hospital of the University of Pennsylvania, February 20, 1879, with marked hæmorrhagic retinitis and incipient cortical cataract in each eye. She said that she had had an attack of sudden loss of vision about a year previously, and that the present dimness of sight had come on suddenly with a flash of light, ten days ago, whilst stooping.

In the right eye V. $= \frac{10}{100}$ by holding the card in the upper part of field; this being slightly improved by a convex lens. The ophthalmoscope showed a long black spike in the anterior cortical, the centre of the lens and the vitreous humor being clear. The disc was slightly prominent, and the retinal veins full and tortuous, with a hæmorrhage into the sheath of the upper nasal vein. Numerous hæmorrhages into the retina, one fan-shaped and extending inwards and upwards from the

[1] Figs. 2 and 3, Plate I., and Fig. 1, Plate II.

Fig. 3. Optic Nerve Entrance, B. ×16.

Fig. 2. Iridectomy, B. ×16.

Fig. 1. Optic Nerve Entrance, M. H. ×21.

Plate II.

disc, another, a large one, occupying the upper macular region just above the fovea. In the lower part of the retina there were several white splotches of absorbing hæmorrhage.

Vision of the left eye, which was slightly improved by a convex lens, equalled $\frac{20}{25}$. Shoots of opacity were visible in the anterior cortical of the lens. The optic disc showed a partial glaucomatous excavation, most pronounced to the temporal side; scleral ring being broadened all around. Hæmorrhages of older date, with one touching nasal side of the disc.

Fields of vision could not be satisfactorily taken, owing to the extreme restlessness of the patient and the want of steady and continuous fixation; blind spots being encountered at times where the chalk (or even a candle-flame) was lost to view.

On April 1st, the right eye being much more cloudy, its cornea hazy, and its tension increased, with a slight hæmorrhage into the anterior chamber, which had failed to yield to eserine and temporal blood-letting, it was resolved to perform an iridectomy, notwithstanding the unfavorable symptoms: this was done with a lance knife incision at the upper part of the cornea, the operation being completed without any accident except that on cutting the iris the anterior chamber filled with blood. The wound healed, and the eye did well until the fourth day, when, just after instilling some drops of eserine, an attack of violent pain came on, accompanied by increased clouding of the cornea, followed on the ninth day by a recurrence, without any exciting cause. On the twenty-fourth day, the patient had lost all perception of light in the eye, and the cornea was still too hazy to permit a view of the details of the fundus, although a faint red glare could be seen through the pupil. The cicatrix was bulging, with large red vessels running to it. Tension equalled + 2. This condition was followed every few days by a series of exacerbations with intense pain and greater cloudiness of the cornea. The left eye remained about as at first examination. The patient being unwilling to part with the eye, on the 27th of May an attempt was made to perform a neurectomy. The internal rectus was divided, and a cat-gut suture passed through its

proximal end, but the muscle was so rotten that the stitch pulled out on the slightest tension. The optic nerve was then cut, and the posterior end of the globe turned forward to make sure that the optic and ciliary nerves were all thoroughly divided. At this time there was so free a hæmorrhage into the capsule of Tenon, that the lids were swelled shut, and the fissure closed so tight that it was impossible without constant forcible pressure to retain the eyeball in the socket, this persisting even after cutting the outer canthus. The eyeball was, therefore, enucleated, the wound healing slowly, though without accident. The patient was discharged a month later. The vision of the left eye at this time was $\frac{20}{100}$, the pupil being round, the iris sluggish, and tension slightly increased. A year later she returned to the Dispensary, when vision had fallen to $\frac{10}{70}$.

Dr. Edward Jackson, who saw her subsequently, kindly informed me that in September, 1880, she still had occasional pain in the eye, although it was never severe; that vision was dimmer, but there was still sight enough to go about unaided; and that this state of affairs continued unchanged until the patient died of apoplexy one year later.

The photomicrographs of sections of the enucleated eye (Figs. 2 and 3, Plate II., and Fig. 1, Plate III.), show that there is a commencing more or less saucer-shaped excavation of the optic disc, which is deepest to the temporal side; the tissue once forming the head of the nerve being pressed down against the tissue of the lamina cribrosa, to which it is united. The lamina cribrosa is also curved backwards. These changes must have taken place in a period of three months, because at the first presentation of the patient, repeated and careful examinations showed that the disc at that time was slightly prominent. A further study of these sections shows that there were hæmorrhages in the sclerotic, and in and around the canal of Schlemm. The retina is also full of hæmorrhages, which are mostly irregular in form, and lie in the inner nuclear layer, though occasionally passing outwards and invading the outer nuclear layer, even to the external limiting membrane; there being but few in the fibre layer.

Fig. 3. Optic Nerve Entrance, G. x25.

Fig. 2. Cystoid Cicatrix, G. x16.

Fig. 1. Retina, B. x50.

PLATE III

Although we often see extensive retinal hæmorrhages without increase of intra-ocular pressure, yet in this case the hæmorrhages in the retina seem to have been the exciting cause of the increased intra-ocular pressure. I am inclined to think that this is not infrequent, where they occur in an eye in which there is any obstruction to the return circulation of the blood or lymph. The case is interesting, because it presents one of the rare complications which may render the operation of neurectomy nugatory.

Secondary Glaucoma supervening after a Peripheric Linear Operation for Cataract.

M. G., aged sixty-six years, was admitted to the hospital of the University of Pennsylvania on the 27th of September, 1886. The patient stated that ten years previously, whilst in Manchester, England, he had had an operation for cataract performed upon the right eye, followed by a similar operation upon the left eye one year later. Both of these operations were successful, the patient seeing "fairly well" with his glasses. Eighteen months after the first operation a secondary operation was done upon the right eye, the pupillary opacities being needled. After this the eye appears never to have become altogether quiet.[1]

Examination of the right eye showed that it was red, its cornea hazy, and that there was much increase of tension (T + 2). No light perception. Just above the cornea there was a cicatrix from a peripheric linear operation for cataract, the cicatrix being cystoid and bulging at both ends. The left eye presented a somewhat similar cicatrix, less cystoid than that of the fellow-eye, though slightly prominent, with impalement of the iris at each end of the scar; the outer end of of the cicatrix being most prominent. With this eye the patient could see to count fingers at five feet. The eye was watery,

[1] In a letter dated 30th July, 1887, Mr. David Little of Manchester, England, writes: "When I saw him last, it was January, 1886. It was then noted, "right eye inflamed since November last, sight lost for six years." At present, conjunctiva with thick purulent discharge. Iris bulging at each corner of wound. Anterior chamber half filled with blood. No perception. T.+2." . . . . "Date of first operation was April, 1875."

sensitive to light, and giving out readily when any object was fixed.

On the 27th of October, he was admitted to the hospital. On the day following, ether was administered, and the sightless eye enucleated, causing a free hæmorrhage into the capsule of Tenon, with swelling and closure of the lids, which was readily controlled by a pressure bandage. With the exception of more discharge than usual from the socket for a time, there was no drawback to the healing. The sympathetic irritation in the fellow-eye was entirely relieved, which at present with $+\frac{1}{4}$ *s/h.* has a vision of $\frac{20}{100}$.

The microphotographs (Figs 2 and 3, Plate III.), show sections through the extensive cystoid cicatrix, and through the complete excavation of the head of the nerve.

In conclusion: a study of the cicatrices of these three operations shows, in each case, a displacement of the relative position of the corneal flap and of the corneal stump from which it was cut. In each instance the edge of the flap rides up a little, while the cut edge of the proximal portion of the cornea projects deeper into the anterior chamber. In comparing them with the beautiful and careful drawings of Becker in his "Atlas of the Pathological Topography of the Eye," we find that a large majority of his plates representing flap operations, with and without iridectomy, Graefe extractions, and iridectomies, show a displacement of the cut edges in a corresponding manner—while two of them (Plate VII. Fig. 2, in the large Atlas, and Fig. XXI. of the small Atlas[1]), give examples of the end of the flap being deeper in the anterior chamber, while the proximal edge of the cornea rises slightly above it. In a few instances only are the inner edges of the incision nearly on the same level.

These facts seem to me to present good anatomical reasons for the utmost diligence on the part of the practitioner to prevent any undue motion of either the body or eyes of the patient after operations, until the wound is sufficiently closed by adherence of the cut surfaces to make it probable that it will not readily give way or be displaced.

[1] "Photographische Albildungen von Durchschnitten gesunder und kranker Augen." Wien, 1876.

DISCUSSION.

DR. NOYES.—In reference to the matter of cystoid cicatrices and prolapse of the iris, an opportunity was afforded me of making an examination in a case which I reported to the Society last year. This patient died five days after the performance of a cataract extraction after the Graefe method. The subsequent study of that case proved extremely interesting with reference to the mechanism of prolapse of the iris. Everything in the performance of the operation was entirely normal, the healing process was going on satisfactorily and during life there was no evidence of prolapse of the iris. At the autopsy it was found that on the temporal side, what may be called the scleral and distal edges of the corneal cut were of equal size and in accurate apposition. On the nasal side, the scleral side of the corneal cut was swollen and double the thickness of its distal side. It was at this point that the iris had entered and become incarcerated so as to make a cystoid cicatrix, although it did not protrude externally. On the nasal side, there was left a triangular space between the two surfaces. For some reason excessive infiltration took place at this angle of the wound in the substance of the cornea, giving rise, on the scleral side, to œdema and swelling, which mechanically prevented accurate apposition of the opposed surfaces, and also mechanically prevented their close union, and the union was exclusively through proliferation of the superficial epithelium. The result was that there was a cavity into which the iris entered. The iris entered because there was a space for it. To my mind that is the explanation why entanglement occurs and why cystoid cicatrix occurs.

I mention this case on account of the corroborative evidence furnished by Dr. Norris. The cause of this swelling of the scleral side of the cut must be anything that causes violence, such as bruising, injury by instruments, etc.

DR. KNAPP.—Is it not possible that the impaction of the iris was primary and the cause of the swelling?

DR. NOYES.—It can only be said that it is distinctly recalled that the iris was returned into the anterior chamber with the utmost care, and, so far as could be ascertained, it was all back.

DR. RANDALL.—In regard to Dr. Noyes's case, it seems that the anterior chamber had been abolished some time previous to the death of the patient, since the posterior capsule of the lens had been in contact with the cystoid portion of the wound, as evidenced by the adhesion to it of pigment belonging to the prolapsed portion of the iris.

SHARPLY CIRCUMSCRIBED HYPERÆMIA OCCURRING IN CONNECTION WITH MUSCULAR INSUFFICIENCY.

BY J. A. LIPPINCOTT, M.D.,
PITTSBURG, PA.

THE scientific tendencies of modern medicine in all its departments are apparent especially in the great importance attached to the revelations of instruments of precision. All along the line these appliances are displacing the unaided senses in the investigation of pathological phenomena. As a consequence, we hear more and more of the signs, and less and less of the symptoms, of disease. This phase of medical progress is illustrated by the meagre space devoted, in the more recent works, to the symptoms of muscular asthenopia, while the signs, as developed by prisms, are elaborately stated. Now, although the subjective conditions observed in one form of asthenopia are frequently found in other forms of the affection, nevertheless symptoms have a certain value, and the time has not arrived when they can be relegated to the limbo of the obsolete.

We not infrequently meet with cases of asthenopia, of all varieties, in which there is a slight redness of the globe or lids. I have had under observation three cases in which the chief trouble complained of was a peculiar and very pronounced congestion of the nasal side of the eyeball. Investigation led me to believe the real difficulty to be insufficiency of the internus. I shall relate only two of these cases, because of the third I could speak only from memory.

CASE I.—S. H. D., a colored barber, aged twenty-four, consulted me April 5th, 1878, for redness of the right eye. The congested area was sharply limited, and had the form of a pterygium with a rather narrow base, the apex extending

nearly to the corneal edge. Both deep and superficial vessels were engorged, principally the former. The patient suffered from frontal headache, and experienced fatigue in working and reading. He furthermore stated that the affection had lasted six or seven weeks, and that he had, under medical advice, applied astringents of various kinds without any result.

Suspecting the existence of muscular trouble, I applied the Graefe test, which revealed a decided loss of equilibrium, the vertical lines—at twelve inches from the face—being crossed and over one inch apart. I directed no local treatment, and simply prescribed strychnia. In eight days the congestion had greatly diminished; the Graefe test gave a separation of the lines of one-quarter inch, and the patient felt decidedly better. In four days more the equilibrium of the muscles was restored; the congestion too had disappeared, and, with it, all the other neurasthenic symptoms, including a constipation which had greatly annoyed him.

Case II.—V. B., aged twenty-nine, salesman, May 26, 1887, came to me on account of redness of the left eye, of three weeks duration. As in the preceding case, the discoloration was on the nasal side, was in the form of a pterygium, and was sharply circumscribed. The man stated that he had not strained his eyes in any way; but admitted that he had been reading more than usual at night, and had lately experienced a good deal of weariness at times. General health excellent. Applying the Graefe test, at six metres distance, prism 2° base inward was required to restore equilibrium.

Adduction at 6 metres = 6°
Abduction " " = 8°

The usual tests pointed to the internal rectus of the left eye as the one chiefly, if not wholly, affected. The patient was directed to cease all unnecessary use of his eyes, to procure plenty of sleep, to take strychnia in doses of gr. $\frac{1}{32}$, and to douche his eyes with hot water twice daily.

June 3.—Congestion about half gone.

Dist., Adduction 10°
" Abduction 10°

June 7.—No apparent change in the appearance of the eye since last note.

Dist., Adduction 10°
" Abduction 9°

June 24.—Eye looks normal.

Dist., Adduction 12°
" Abduction 10°

From a study of these cases I think I am justified in concluding that we may have, though probably rarely, a pronounced congestion, typical in character, as a symptom of muscular insufficiency, the grounds for my belief being the form and location of the discoloration, and its disappearance under treatment *pari passu* with the disappearance of other and admitted evidences of an existing muscular debility. It is perhaps impossible, in the present state of our knowledge, to give an absolutely satisfactory explanation of the connection between the muscular debility and the symptom above described; but the phenomenon is doubtless analogous to the congestion observed in cases of violent muscular sprain in other parts of the body.

DISCUSSION.

DR. JACKSON.—While Dr. Lippincott was reading his paper, I was reminded of one to which I had recently listened, on base-ball pitcher's arm. (See *Medical News*, 16 July, 1887.) It occurred to me that here might be a similar condition. The view taken was, that the trouble which cripples many base-ball pitchers is simply an exaggeration of what occurs whenever muscles are over-exercised, or compelled to perform labor to which they are not accustomed. There is then excessive hyperæmia, involving not only the body of the muscle, but also its tendinous prolongations and the bones to which they are attached. The symptoms given by Dr. Lippincott and the history in one case of undue use of the eyes would indicate that here there might be hyperæmia of the whole muscle, and that the superficial hyperæmia was but an extension of this to, and about, its attachment.

GLIO-SARCOMA OF THE RETINA; ENUCLEATION; NO RECURRENCE AFTER 14½ YEARS.

BY HENRY D. NOYES, M.D.,
NEW YORK, N. Y.

MARY CAMPBELL, aged 15 months, was brought to the N. Y. Eye and Ear Infirmary, Sept. 27, 1872, because of the condition of the left eye. The iris and lens were pushed against the cornea, and behind was a yellowish white substance occupying the vitreous. The eye was removed, with the diagnosis of glioma. No detail of the previous history is stated. The anatomical examination, made by Dr. Francis Delafield, is as follows:—

"The cornea transparent; lens pushed against it. Cavity of the vitreous filled with a soft mass to two-thirds of its extent, and most of it is soft and ragged. Opposite to it the retina remains, and on its outer surface are a number of small protuberances. These show well the development of the tumor. The growth seems to begin in the outer granules, in some places involving only this layer, in other places the nerve fibres also. In some places it grows outwards to the limitans externa, forming rounded nodules; in other places it pushes through the limitans externa in an explosive sort of manner.

"The large mass grows inwards, leaving only the limitans externa and rods and cones which are not involved."

On March 16, 1887, the patient, now over 16 years old, and in fine health, came to show herself at the Infirmary. She had worn an artificial eye from the time of the enucleation. There was no irritation in the cavity, and no trace of any return of the disease either in the orbit or elsewhere. The orbit and surrounding parts were as well developed as on the

opposite side, a fact contrary to the prevailing opinion of the effect of enucleation in early life.

There seems from the anatomical examination to be no doubt of the gliomatous nature of the disease, notwithstanding the omission of any description as to the kind of cells which composed the growth. This is accounted for by the fact that other cases of a similar kind are recorded by the same observer, Dr. Delafield, who did not think it necessary to repeat such statements in every description—giving merely the anatomical diagnosis. It is to be noted that no remark is made about the condition of the nerve.

In addition to the above case of entire recovery, I know of another patient who was living eight years after removal of the eye, but I cannot refer to any recorded notes. I heard from him for the last time several years ago.

In view of the very large proportion of instances in which the disease returns and with fatal results, the publication of favorable cases becomes a duty.

The last paper which has come under my notice upon this subject is by Vetsch, *Archives of Ophthal.*, vol. xii. p. 43, 1883 (Am. Ed.). He cites nine cases of permanent recovery recorded by other authors, and adds two cases of his own. He also appends three; one which he calls temporary recovery whose immunity had been for three years and one month; one in which a relapse occurred four years later in the parotid gland, and this tumor was successfully removed and with no return of the disease in two months; and another case with no return after eight months. If these last three cases be excluded as not decisive, they are nevertheless encouraging, and without them we have on record thirteen cases of exemption from re-appearance of the disease.

The ratio which these bear to the total number of cases must be very small, and it is not possible from the incompleteness of our data to speak with accuracy about it. Hirschberg puts the ratio at 6.5%, *i. e.* 5 times in 77 cases which he had observed. But every case of recovery lends force to the importance of removing the eye at the earliest possible period.

PSEUDO-GLIOMA FROM TRAUMATISM—ENUCLEATION.

By HENRY D. NOYES, M.D.,
NEW YORK.

ELDRIDGE VAN S., aged five, Flemington, N. J., came to me May 4, 1887. In November, 1886, he was thrown from his velocipede, and its handle as he fell to the ground struck his right cheek and caused a wound along the lower edge of the orbit. There was profuse bleeding and the subsequent swelling was great, but the reaction subsided in about a week. There was no exophthalmus, and no inflammation of the eye. The attending physician declared that the sight was not impaired, but the mother was not able to concur in this belief. She says that about ten days after the injury the boy could not see a book or a slate or his hat when she tightly closed the other eye. She did not investigate the question again, because she dreaded lest the eye might be blind and she preferred to accept the physician's statement.

There was no appearance of trouble in the eye during the winter, and no complaint was made. Two weeks ago a peculiar appearance was noticed in the pupil, which alarmed the mother and caused her to seek advice.

About one-third of an inch below the free border of the lower lid I found a horizontal scar three-fourths of an inch long; there is no irregularity of the orbital edge or of the bones of the face, and no tenderness on pressure. Pushing the globe back into the orbit does not cause pain; movements of the eye are normal. There is a slight injection of the scleral vessels; the cornea and lens are clear, pupil active, iris has a faint greenish hue instead of the clear bluish-gray of the other eye, although the difference in color is not considerable; tension is slightly minus. A smoky gray reflex shines from the pupil and is most pronounced on the nasal side of the fundus. By the ophthalmoscope a growth is easily seen filling most of the fundus, not reaching as far forward on the

temporal as on the nasal side, which is extremely vascular. Its structure does not seem very solid, but it is rich in small vessels. It has an ill defined appearance, is not lustrous—and not yellow or whitish. There is clear vitreous between it and the lens. No traces of the retina or optic nerve are to be seen.

From the foregoing statement it will be inferred that the diagnosis was in favor of the inflammatory nature of the neoplasm. At the same time certain important facts had to be considered which stood in the way of this conclusion. It was not clear from the history whether vision remained in the eye immediately after the injury. On this point the testimony of the physician and of the mother were in conflict. No complaint was made either of loss of sight, or of inflammation, or of pain during the following six months. The discovery of the absence of sight was accidental, and induced by observing the reflex from the pupil. The obscurity of the development of the neoplasm, its latency, the lapse of time since the injury, seemed to admit the possibility of its having a cancerous quality.

The gravity of such a possibility led me to send the case to Dr. H. Knapp, who returned the following reply:

25 W. 24th St., May 6, 1887.

DEAR DR. NOYES:—

I think we have to deal with a puriform inflammation in the vitreous, the origin on the nasal anterior half of the choroid and the ciliary body. These cases have been called pseudo-glioma. Now this is only a diagnosis of probability, based on the origin of the disease, the diminished tension of the globe, the dark discoloration of the iris, the lack of definition of the mass, giving some red reflex on the temporal side, and the dull yellow white (without any metallic lustre) appearance of the substance. The formation of blood-vessels does not exclude the above diagnosis.

I would advise an enucleation, to err on the side of safety. I should be glad to know what you decide, and in case you and the parents decide for enucleation would like to know the result and see the specimen, if possible.

Yours gratefully,

H. KNAPP.

The situation was fully stated to the parents, viz., that while the probability was in favor of an inflammatory disease, absolute certainty was not possible. In the former case enucleation was not imperative, but would be prudent; in the latter case it would be imperative and must be immediate. They decided in favor of enucleation.

The attempt was made to excise a long piece of the optic nerve, but special difficulty was encountered in getting the scissors about it. A very large pair had to be used, and when the globe came out the reason was found in the extraordinary hypertrophy of the connective tissue enveloping the inferior oblique muscle and the back part of the globe. The muscle itself was unusually large, and evidently there had been great hyperplasia of the deep orbital fascia and connective tissue. The operation was done under ether, and the healing was normal.

Anatomical Examination.

July 18. The eye having been immersed for about two months in Müller's fluid, sections showed total detachment of the retina, and a mass of inflammatory material behind the lens which formed a complete septum continuous with the ciliary body. The retina was irregularly folded upon itself in places. The object which to the ophthalmoscope simulated a tumor proves to be the surface of the inflammatory exudation, which proceeded chiefly from the ciliary body. In other words, the case of pseudo-glioma turns out to be plastic cyclitis with absorption of the vitreous and total detachment of the retina.

The origin of this process seems to have been from injury of the floor of the orbit, perhaps a fracture, or violence impinging on the lower part of the globe, which gave rise to the cellulitis and thickening discovered at the enucleation and developed into the intra-ocular lesions. No doubt vision was destroyed at the time of the accident or during the immediate reaction, while the formation of the inflammatory mass and the separation of the retina took place during the following six months.

DISCUSSION.

DR. THEOBALD.—In connection with Dr. Noyes's case of glioma, I should like to report a case which has gone nine and one half years without a return. The only weak point in this case is that a microscopical examination was not made of the tumor. The macroscopic appearances were, however, characteristic, and to my mind there is no question as to the correctness of the diagnosis. The eye was removed January 31, 1878, when the patient was six years of age. I have seen the boy once or twice since then, and the other day I hunted him up. He is now a telegraph messenger boy. The orbit is perfectly normal, and he has had no symptoms suggesting a return of the affection.

DR. KNAPP.—I should like to add a word. I think that Dr. Noyes has been very prudent in speaking of this case as one of immunity for so many years. Until lately, I thought that there was such a thing as a permanent cure of true glioma, but now I am very doubtful of it. There are exceptional cases which do not terminate fatally for from ten to fifteen years, just as there are of choroidal sarcoma. If they do not die of the initial lesion, they die of a generalization of the tumor. I operated on a case of true glioma in New York. I made the enucleation in the second stage, when there was glaucomatous tension. The patient lived ten or twelve years after operation, but I have since learned that he is dead; but I cannot say whether or not the death was due to glioma. This is, therefore, a doubtful case.

In another case of true glioma, after enucleation, an orbital relapse occurred. The orbit was cleaned out, and six years afterwards (last June), the patient was still living, with no evidence of a return. These are the only two cases of which I have recollection. I think that it is doubtful whether any of these cases will live. Von Graefe said that they all die. He never knew a case that lived longer than four years after the operation.

DR. CARMALT.—I was much pleased to hear Dr. Knapp's views with reference to the pathology of this affection. They agree entirely with what I have learned and taught with regard to the constitutionality or specificity of sarcomas (and glioma is a variety of sarcoma) as compared with milder connective tissue growths. It is quite important to bear in mind that there is something which induces the return of these growths other than local remnants. It is not that they are not thoroughly eradicated,—they may be entirely,—but the

traumatism of the operation causes them to come back in the scar. That patient's connective tissue does not mature to fibrous tissue, but remains in the embryonal stage of sarcoma.

Dr. Knapp's statement, that if the patient did not die of some inter-current disease, there would be a return of the affection, even after years, is based upon a larger experience than I have had, and indicates a belief in the constitutionality of the disease beyond what I have cared to assert. I am glad to hear so positive an expression of opinion from one with so wide opportunities for observation.

I rise, however, to speak with reference more particularly to the difficulties of diagnosis in the case of glioma, and would ask the speaker if he does not remember a case which occurred some twenty years ago in a child six months of age who was brought to the New York Eye and Ear Infirmary totally blind in both eyes, with a greenish reflex from each fundus, apparently from a tumor in each eye? It was decided that the child had double glioma. Both eyes were enucleated as the only chance of saving its life. The appearances were so deceptive that the whole staff agreed that it was a case of glioma, yet on examination the condition was found to be due to total, congenital detachment of the retina.

Dr. Fryer.—Speaking with reference to the diagnosis of intra-ocular tumors, I would ask Dr. Noyes if he has used the electric light. In two cases I have had great assistance in diagnosing the presence of small tumors, where the vitreous was cloudy, by the use of the electric light.

Dr. H. D. Noyes.—I cited this case of pseudo-glioma for the sake of pointing a moral, not to adorn a tale. While I have seen a good many cases where I had no doubt as to the cancerous nature of the tumor, yet I have also seen cases where I was unable to give a decided opinion. I do not hold it blameworthy in an oculist to be unable to say positively whether a given appearance is due to cancer or to an inflammatory process. It was one of my early experiences to see Graefe remove an eye for glioma, which contained only a mass of inflammatory exudation. After an experience of over twenty-five years, coming again in the presence of a case where I was in doubt whether the new growth was cancerous or inflammatory, I felt that it was well to report it.

In respect to the mode of illumination for the examination of an eye where there possibly is a tumor, I have not used the electric light, but have used strongly condensed light. I use a large concave mirror with a focal length of about four inches. That gives a most intense illumination of the fundus

of the eye. It was with a mirror of this sort that I examined the eye of this child.

DR. PROUT.—I have reported some cases of this disease, plastic exudative cyclitis, in the American Journal of Ophthalmology, in one of which, in the eye of a child, rupture of the eye-ball occurred posteriorly, and the inflammation seemed to extend to the brain. Death resulted. I believe that life might have been saved if the ball had been removed.

With reference to the diagnosis: these exudations, when they occupy the hyaloid fossa, present a smooth concave surface, that is, have taken the curve of the posterior surface of the lens. No gliomatous mass could grow forward so as to produce this effect *and no more.* Before the tumor could flatten itself against the lens there would be displacement of lens, &c., and most probably rupture of the sclera. This point I consider of importance.

DR. RANDALL.—I recall a case operated on at six months by Dr. McClure, which came to my notice seventeen years after the eye was enucleated; but I am unable to say that it was a true case of glioma. The point that particularly interested me was that the fear that is often expressed, that absence of the ball from the orbit will lead to asymmetry of the face, was not realized in this instance. The face was perfectly well developed and symmetrical.

DR. KNAPP.—With regard to illumination, I would say that, in these blind eyes, I have used sun-light. Through a hole in the shutter the light could be thrown into the eye. I saw this used on a larger scale by Prof. O. Becker. In his dark room he has an arrangement enabling him to examine the light and color sense. Direct sun-light may be of advantage in the diagnosis of certain cases of glioma and of sarcoma, where the fundus is sometimes too dull to distinguish a sarcoma from a detached retina.

DR. GRUENING.—In the light of the present discussion, it seems important to recall all the cases in which apparent immunity has been enjoyed as regards the recurrence of glioma. I have two cases to report. The first case was operated on in 1875, at the Ophthalmic and Aural Institute of New York. It was the case of a girl five years of age, with true glioma. The optic nerve was not invaded. There has been no recurrence. The girl is now eighteen years of age, and is still under observation in perfect health.

The second case was that of a child one year of age, operated on in 1880. It was a case of true glioma, not involving the optic nerve. This child is now perfectly healthy. Both

of these patients have been wearing artificial eyes since the operation. There has been immunity for twelve years in one case and of eight years in the other.

DR. DENNETT.—I have used almost every kind of light in the examination of eyes. On one occasion I examined two schools, of one or two hundred scholars each, with sun-light. I have been experimenting with the electric light, and have concluded that the main thing is to get the requisite *amount* of light. With the slight disadvantage which the color of most artificial lights involves, I think that it makes no difference what kind of light is used. In the examination of morbid growths, I should suppose that it was important to take out from the light the element of color. If you employ the electric light, you can increase its intensity until it is practically as white as sun-light. You get as good illumination with the gas-light, with the exception of the slight color. The electric light is the most manageable if you have the battery, etc., in the office. If you have not, a hole in the shutter with a large mirror can be employed in bright weather.

TRANSMITTED PULSATION AT THE FUNDUS OCULI.

BY W. F. MITTENDORF, M.D.,
NEW YORK.

THE current of blood passes through the retinal vessels in such a manner that only at times this movement becomes visible in the ophthalmoscopic picture which is obtained by the direct method, and which is of course even less apparent to the observer employing the inverted or indirect method. In the great majority of cases the pulsation, if visible, is observed in the veins, whereas the arterial pulse is so rarely seen that its appearance has usually a pathological bearing. The reason why the movement of the blood is not more frequently seen, is probably due to the fact that the blood

current is surrounded by a colorless fluid contained in the perivascular sheath. The thickness of the sheath, as well as the quantity of the perivascular fluid, must necessarily vary in different individuals, and the pulsation of the blood must be more or less hidden by it; but, on the other hand, the pulsating movement must likewise to a certain extent be transmitted to the sheath and the surrounding fluid, and this transmission may be continued through the external sheath to parts connected with it, but not directly with the blood current itself, even in otherwise normal eyes. The case I wish to relate, and which I am sorry not to be able to show before you to-day, presents the peculiar appearance of pulsation of a connective tissue band, which runs from one vessel to another in such a manner that the slightest pulsation, so slight that it is even not noticeable with the ophthalmoscope in the vessel itself, becomes very marked in this part described. This band acts not unlike the indicator on a sphygmograph. It has the appearance of a small canal, connecting the perivascular fluid of the one vessel with that of the other. In fact, it took some time to decide whether it was really a small bag with pulsating colorless fluid, or merely a band of connective tissue, showing the motion of the blood-vessels, by transmission, to an exaggerated extent. This opinion was shared by my distinguished colleague, Dr. E. S. Loring, who saw this unusually interesting case with me.

The patient, a young student, fifteen years of age, came to me for some slight asthenopic trouble, probably more due to abuse of the eye than to the very slight error of refraction, hypermetropic astigmatism of 0.25. He showed no signs of disease whatever, had a perfectly normal heart and enjoyed good health. The fundus oculi, as well as the tension of the eye, was perfectly normal, and the media were perfectly clear. The blood-vessels were rather large, and the arteries as well as the veins presented an unusually large central white streak of reflection, and around the vessels, as they passed over the optic disc, the perivascular sheath was very well marked. There was some of the watered silk appearance over the rest of the fundus, but there was not the slightest

pulsation of the veins or of the arteries visible, although it could be easily produced by pressure on the eyeball.

A short distance above the disc a grayish white band, resembling a slender semitransparent bag filled with fluid, stretched from one of the larger veins to another vein, being on the same level with them, and making a slight curve with the convexity upward. At the centre of this curve was a slightly pointed projection. In this band, especially at the apex of it, the most perfect appearance of pulsation existed, it apparently filling and emptying its contents with each pulse beat. The pulsation corresponded with the pulse, and increased or diminished like this in frequency. A slight muscular effort would increase the pulsation from seventy, which was the usual pulse of the young man, to seventy-five or eighty, according to effect of the exercise on the action of the heart.

The patient was seen a number of times during the month of May of this year, and the appearance of the pulsation was always the same. A little higher up and more to the nasal side of this band-like process there was another smaller one connected with an artery, which, upon pressure of the eyeball, would commence to pulsate in the same manner as the first one. In the second one the nature of the formation was unmistakably that of a connective tissue band, and this made us assume that the principal formation, connecting the two veins, was of the same nature, although it looked very much like a tube filled with fluid, and that it was thrown into pulsation by the meeting of the vibrations of the two veins.

DISCUSSION.

Dr. Howe.—In connection with pulsation, whether intraocular or within the orbit, I would say one word. I have here an instrument called a plethysmograph. It consists of a cup to go over the eye, attached to a rubber tube, and the latter ends in a capillary glass tube. In this latter is placed a little colored ether. It was quite a revelation to find that I could get excursions of the liquid of one or two inches. It may be of interest in finding the pulsations in the normal eye and comparing them with those of eyes of increased tension.

As far as observation goes, it is extremely interesting, but I have seen pulsations in an orbit where there was no eye.

DR. JACKSON.—A few months ago I saw in front of the optic disc a little tag of connective tissue, projecting from a perivascular sheath over a rather deep physiological cup, that showed a distinct movement with every radial pulse. I could not detect spontaneous pulsation of any retinal vessels. The appearance was observed in both eyes of the patient presenting it.

SPONTANEOUS PROLAPSE OF THE LACHRYMAL GLAND.—ITS EXTIRPATION.

BY HENRY D. NOYES, M.D.,
NEW YORK.

MISS CARRIE S., aged twenty, Paterson, New Jersey, came February 8, 1887, because of a swelling under the upper lid of the right eye which had been growing for nine years. Within a few months it had become uncomfortable. It rested on the eyeball at its supero-external side, and reached within 6 mm. of the cornea. It was flattened, not lobulated, and nearly circular in outline, and merged gradually into the surrounding conjunctiva. A few vessels coursed over it and it had a faint yellow color. It was nearly three-fourths of an inch in diameter. It could be moved freely upon and also moved with the globe. It was very compressible and elastic. It seemed to have a capsule which at its lower border was densely white and firm; over the remaining surface it was thin and translucent, but, as already said, with a yellow tinge. There had never been any blow or sign of disease in this region, there had never been any inflammation or serious pain. The progress had been very gradual and the cause was unknown.

Attention had been called to its appearance at an early stage of its history, because the other eye had been lost

thirteen years before by an accident. This globe was atrophied, yet on lifting the upper lid a rounded mass, red and slightly lobulated, and a little larger than a cherry stone, appeared at the upper and outer angle of the orbit, and was regarded as a part of the lachrymal gland which had become displaced.

The tumor of the other eye was regarded as either a fatty mass or a cyst. Its extreme elasticity favored the idea of a cyst, while the yellow tinge seemed to indicate adipose tissue. Extreme mobility might belong to either structure. But the true character of the mass was not revealed until it was removed.

An incision was made obliquely across the tumor and the conjunctiva dissected off by the closed blades of curved and sharp pointed scissors. Very little cutting had to be done, and the hæmorrhage was moderate. When the mass was separated it proved to be the normal lachrymal gland.

The conjunctival wound was stitched and a bandage applied. The healing was prompt and the reaction moderate. A wrinkled and swollen condition of the conjunctiva remained for a few weeks at the site of the operation.

The production of this prolapse seems to be by simple laxity of the enclosing fibrous capsule, without any propulsion from behind. A similar tendency was evident in the lachrymal gland of the other eye, but not fully developed because of the atrophy of that globe.

The catalogue of the library of the office of the Surgeon General at Washington gives references to four cases of displacement of the gland, viz. by Rampoldi, by Briere, by Mauthner and by Snell. The first two were caused by caries of the orbit with consequent orbital inflammation. The case reported by Mauthner was a patient of Jaeger's in whom there had been diffused keratitis for four weeks, accompanied by protrusion of the gland. Jaeger treated the case with iodide of potassium for five weeks, without benefit to the tumor. An incision into it and microscopical examination revealed its character, whereupon Prof. Jaeger pressed the gland up to its place and applied a compressive bandage for sixteen days, which sufficed to keep it in situ—by help of the adhesive inflammation which

AN OPERATION FOR ENTROPIUM OF THE LOWER LID.

The following case represents a severe type of this affection, against which the methods commonly in use prove to a great

Norah C., aged eleven, had for years suffered from trachoma, more especially in the left eye, and had marked entropium of the left lower lid without any special deformity of the upper lid; she also had pannus of the left cornea, especially of the lower half, where it was rubbed by the lashes. The tarsus was much shrivelled and the conjunctiva shortened.

I performed the operation of cantholysis, and at the same time adopted the following procedure to insure permanent

At a point about one fourth of an inch from its edge, I incised upon a director straight downwards the full length of the lower lid and 4–5 mm. wide. This piece of skin was left attached at its temporal extremity and the wound closed by sutures; one half of the piece was cut off, the edge of the lower lid was denuded for a short space very near the outer canthus, and upon this spot the flap of skin was attached by one or more sutures, bridging over the intervening healthy integument. It acted like a piece of tape or sticking plaster to draw out the ciliary border of the lid. In two or three days the sutures were removed, and the patient soon after ceased attendance.

On March 18, 1887 (four years after the operation), the girl returned. The band of skin still adhered to the lower lid, and drew it down. It was severed from its connection at each end, and the lid retained a normal position. There is no irregularity of the border. The deformity has been cured. The cornea is clear. No doubt the result was secured within a few weeks after the operation. For peculiarly obstinate cases this proceeding promises to be useful.

DISCUSSION.

Dr. Green.—I desire to say a word regarding the operation for entropium, with trichiasis, of the lower eyelid. I think it is the experience of every surgeon that, except in cases of spasmodic entropium, the operations in common use are very unsatisfactory. I have been, for several years, in the habit of operating substantially according to the method first pointed out by Anagnostakis, but with the addition of an incision carried through the conjunctiva, and into or through the tarsus, parallel to and from one to two millimetres distant from the line of implantation of the cilia. This incision constitutes the final step in the operation, and is made after the incision of the skin and the suture of the upper lip of the cutaneous wound to the lower border of the tarsus have been completed. The permanent results have been, on the whole, very satisfactory—much more so than in the cases in which I have performed the original operation of Anagnostakis.

Dr. Seely.—Is not this the operation that Hotz does on the upper lid?

DR. GREEN.—No. The original operation of Hotz, like that of Panas, is essentially the procedure of Anagnostakis, in so far as regards the incision of the skin (or excision of a strip) and the mode of applying the sutures. Thus far the operation is simply an improvement, and a very great one, upon the ἀναβραφή and καταβραφή of medical writers of the Byzantine age. Hotz has since supplemented the suture, as applied to the upper lid, by splitting the lid-margin, after the manner of Arlt, and later by excising a wedge-shaped strip from the front of the tarsus, as taught by Streatfeild and Snellen. The incision which I have advocated is, as I believe, substantially that which Celsus directs to be made in the upper lid, and which Aëtius and Paulus Aegineta designate by the name ὑποτομή. It is interesting to note that this incision, which I have found of very positive utility in operations upon the lower lid, is expressly rejected by the older writers as unnecessary, or even as likely to be injurious, in this situation; it constitutes an essential part of the ancient operation upon the upper eyelid.

DR. GRUENING.—I have cultivated this method of Hotz. I find that entropion of the lower lid is not more difficult to treat than entropion of the upper lid. I put the sutures through the whole thickness of the lower conjunctival sac, not only through the orbito-tarsal aponeurosis, but also through the conjunctiva in such a manner that all the soft parts are reefed. Nothing is removed, and the eversion of the lid is immediate, complete, and permanent. I have now under observation six cases that have been operated on in the last five or six years. The results in these cases have been satisfactory.

DR. H. D. NOYES.—There are, however, cases where burns of the lower lid have been followed by shrinking, and where the conjunctiva, from old trachomatous degeneration, has been converted into cicatricial tissue. When in the presence of a case of that sort, my accidental discovery may prove a useful procedure.

THE EYE OF THE ADULT IMBECILE.

BY CHARLES A. OLIVER, M.D.,
PHILADELPHIA, PA.

THE following observations and conclusions in reference to some of the ocular symptoms that were obtained from the study of the eyes of twenty young adult male imbeciles at the State Hospital for the Insane at Norristown, Pennsylvania, and which are a continuation of a series of studies of the ophthalmic condition of definite groupings *en masse* of special forms of symptomatic nerve malformation and disease, are here presented, not as a *resumé* of the state of the eyes seen among such subjects (which will be given as a part of the Second Annual Report of the Ophthalmological Department of the Hospital), but as a contribution to the subject of the significance of the local condition so generally found in adolescent and young adult eyes, which are the victims of asthenopia and are undergoing changes in refraction. In this particular, the subject is approached from a new and almost unique standpoint,—that of negative evidence. It argues, that as we find in the eyes of this class of cases (where little or no employment for maintenance of vision for near objects is seldom, if ever, brought into play) a direct negation, in proportion to the amount of use, of those local changes which are so frequently seen in eyes which have been much used for prolonged fine and close work, that these changes must be but the visible evidences of the wear and tear upon disturbed delicate tissue and structures.

During the examination, the following precautions were observed:—

First.—Care was taken to exclude all but the proper class of subjects, no one being admitted who could not be properly

designated as one with decided loss of mental power, of a minor degree than idiocy, from malformation or disease of the nervous system, either supervening in infancy or occurring before birth. This was done so as to avoid any error that might arise from the presence of ocular symptoms which might be dependent upon other malformation or disease, and to exclude any question as to the intelligent use of eyes for prolonged near work during the early years of life.

Second.—Subjects chosen whose eyes were free from extraneous disease or inflammation. Sore eyes of inflammatory and traumatic type were avoided, so as to obtain as nearly as possible, representative peripheral (end) organs of comparatively healthy functional activity.

Third.—Young adults were used. This was done for two reasons: first, to have the eye at its full maturity, and thus not to allow any question of further development to enter into the argument; and second, to have the tissues of the eye at their best, before any of the processes of natural decay should have manifestly asserted themselves.

Fourth.—Males have been taken. These were chosen so as to avoid any errors that might arise from additional ocular changes which might be associated with diseases peculiar to the female sex.

Fifth.—Every subject was submitted to the same routine examination, thus preventing any seemingly gross changes to appear that might arise from differences in methods of study.

The reasons for such rules must be obvious, as by their observance, all faults in working and want of precision in method are reduced to a minimum, and the conclusions, which are the very import of the entire work, are thus rendered more valuable and less liable to grave and deceptive error.

In framing the observations, it has been found necessary, by reason of the mental incapacity of the subjects, to divide the results into two groupings, the subjective and the objective; the former resulting, for the most part, in a series of negative and questionable inferences, while the latter terminating in a set of fixed and definite conclusions.

OBSERVATIONS.

Subjective.

First.—Direct vision for form, as a rule, normal.[1]

Second.—Accommodative action: impossible to obtain any reliable result.[2]

Third.—Visual field: nothing could be gotten.

Fourth.—Color perception probably normal.[3]

Objective.

Fifth.—Pupils generally, relatively equal in size, but frequently opposed to each other in their long diameters; the average size being two and a half millimetres in horizontal meridian.

Sixth.—Irides equally, though sometimes sluggishly, mobile to light-stimulus, convergence and accommodation.

Seventh.—Extra-ocular motion intact in all directions. By the ordinary tests, very slight insufficiency of the interni found to exist in but one-half of the cases, the remaining half preserving proper muscle-balance.[4]

Eighth.—Optic disc seemingly healthy, more so than would be expected for age.

Ninth.—Physiological excavation frequent, usually small, shallow, oval in outline (the long axis bearing no definite relation to the long axis of the disc) and generally occupying a position slightly to the temporal side of the centre of the disc.

Tenth.—Scleral ring, as a rule, visible all around disc, and slightly broader to the outer side, being but seldom hidden above and below.

Eleventh.—Pigment massings beyond scleral ring, generally limited to narrow, concentric splotchings and double loops

[1] This was obtained by having the subject compare letters cut and held in his hand, with the variously sized types placed at proper distances. Frequently when this was unsuccessful, resource was made to small articles such as keys, coins, etc., of about the same size as number XX. type; these were held at twenty-feet distance (or less, as necessary), and the patient made to select the duplicate amongst those in his lap.

[2] Various plans, both subjective and objective, were tried, but no trustworthy answer could be obtained.

[3] Easily done by Holmgren's method.

[4] This is in contradistinction to the presence of insufficiency of the interni which was most readily obtained by the same plans amongst the epileptic dements, a class of cases in which intelligence as a rule is constantly decreasing.

with undisturbed areas beyond and between; these, as a rule, more pronounced to the nasal and temporal borders of the disc; the outer massings being most usually crescentic. In a few instances, nothing but annular pigmentation with clear cut edges could be seen.

Twelfth.—Entire absence of the so-called absorbed conus. In no case could a broad crescentic area of bared sclera be distinctly seen; the temporal massings in those eyes which were presumably used the most, being roughened and broken on their outer edge, and connected with small and narrow areas of disturbed retina and choroid.

Thirteenth.—Fibre layer of the retina but very slightly increased in thickness; the fine and ofttimes almost imperceptible striation being almost entirely limited to the superior and inferior portions of the nerve border, and extending but a short distance out into the retinal plane.

Fourteenth.—Very few lymph reflexes and opacities of vascular sheaths, these being mostly confined to the main venous stems at their exit on the disk.

Fifteenth.—Retinal vessels about normal in comparative size, and in a few instances carrying impoverished blood; the arterial blood in two cases being so pale as to permit the venous column of underlying vessels to be plainly recognized.

Sixteenth.—No changes in the choroid except a somewhat granular condition, more pronounced in the macular region; this sometimes being accompanied by a slight absorption of epithelium (especially amongst the most intelligent).

Seventeenth.—Almost equal degrees of hypermetropia, with slight amount of astigmatism present in every case; the average amount of H. (without paralysis of accommodation) being one and a half dioptrics to two dioptrics.

Eighteenth.—Entire absence of any congenital external or internal gross local malformation.

Nineteenth.—The less imbecile the subject, the more common were the ordinary conditions seen in the used eyes of the mentally healthy.

It must be remembered that these observations do not hold absolutely good as written in every individual case, each

subject presenting different degrees of the main features expressed, in seemingly due proportions to amount of intelligence and consequent use of eyes for continued near work. They merely show what should be expected in an average case, and thus serve to express the type.

It may be interesting to note that the following averages have been made: Age—twenty-three years; height—five feet and seven inches; complexion—eight brunettes, four blondes, and seven medium; nativity—eighteen born in United States, one in Ireland, and one in Scotland; intra-pupillary space—fifty-five millimetres; corneæ—eleven millimetres in horizontal diameter; pupillary diameter—two and a half millimetres in horizontal meridian.

CONCLUSIONS.

First.—Although it must be conceded from the results of the many researches made in reference to the so-called sensory deficiencies amongst imbeciles (more properly amongst idiots) that the end-organs do suffer in obtaining a physiological perfection, yet the present study tends to show that the adult eye of such subjects is an organ which is capable of proper functional activity, and that the want of action is in the main due to what may be termed intellectual hebetude.

Second.—By reason of mental incapacity which has supervened in such subjects, before the eye has been brought into continued and constant action as an instrument of accurate and delicate use, the ordinary appearances seen in the used eyes of the mentally healthy are lessened in due proportion to the amount of work given to the organ.

Third.—The eye of the imbecile, being practically an unused organ for close and careful near-work where prolonged action of both the extra-ocular muscles and intra-ocular muscles with consecutive increase of nutritive fluids is necessary, the distention of the globe and elongation in its visual axis, with consequent increase in index of refraction so frequently seen in the over-used eyes of the healthy adolescents,[1] is almost entirely avoided; this being in direct ratio to use.

[1] Vide Norris's article on "Some Remarks on Asthenopia and the Changes in Refrac-

Fourth.—The want of these physical changes, which is shown by a proper balance of muscular action, a persistence of congenital hypermetropia, and an abnormally healthy appearance of the eye-ground (presenting a picture that is almost identical to the one seen during infantile existence), may be considered as significant of a type of unused, healthy, adult human eye.

Fifth.—The healthy eye of the adult imbecile, therefore, serves to teach us that the conditions known as: insufficiency of the interni; dirty-red, gray appearance of the optic disc; irregularity of physiological excavation; non-visibility of the superior and inferior portions of the scleral ring; absorbing conuses in all of their varieties; increase in density and thickness of the retinal fibres; opacities of vascular lymph-sheaths; disturbed states of the choroid; and gross errors in astigmatism, with changes in indices of refraction—which are so frequent in the used eye of the mentally healthy—must be considered as pathological changes expressive of low inflammatory action, with stretching and distortion from increased intra-ocular and extra-ocular pressure; these being representatives not only of general want of tone so often seen amongst those of sedentary life, but of constant and frequent abuse of a delicate organ.

DISCUSSION.

DR. JACKSON.—There is an interesting point not bearing upon the main subject of the paper, but incidentally referred to in the statement that in these cases the Doctor had been unable to measure the accommodation. I think that in the shadow test with the plane mirror, we have an easy and satisfactory way of measuring the accommodation objectively. It is sometimes possible to do it by direct ophthalmoscopic examination, but less satisfactorily. Hold in front of a plane mirror some object, on which the patient is made to fix his eyes; and then approach the mirror to the patient's eye, until the point is reached where the reverse movement of the light area in the pupil is no longer perceptible. We have then the near point of accommodation. We can tell whether or not the patient is making an effort at accommodation by watching the direction of the visual axes. I have used this method with satisfaction in examining young children.

THE "HOHLSCHNITT" OF VON JAEGER IN THE EXTRACTION OF CATARACT.

By B. ALEX. RANDALL, M.D.,
PHILADELPHIA, PA.

As conversation with a number of ophthalmic surgeons, even men who had studied with von Jaeger, has shown many of them to be practically unacquainted with the advantages of his method of operation, and since the published account of that operation contains misprints that render it unlikely that its value will be appreciated by those who read it, it has seemed not amiss at this time and place to venture a word upon an important and neglected matter. Von Jaeger's paper, "Der Hohlschnitt, eine neue Staar-Extractions-Methode," Vienna, 1873, contains general discussions which rather encumber his subject-matter; claims which may seem unfounded; descriptions of instruments unessential to the operation and of doubtful value; and blunders as to the details of the operation, which as they stand, would deservedly condemn the whole. The cardinal point in the matter, which lies *not* in the "Hohlschnitt," but in the *Hohlschnitt knife*, is so obscured that I have known men to supply themselves with his whole set of instruments, only excepting the essentials, the knives.

Waving theoretical considerations, let us look for an instant at the usual modern incision for cataract-extraction—its aims, its methods, and its dangers—and see what advantages are offered for its performance with the knife of Jaeger.

If we accept v. Arlt's section of the normal eye and his description of the modified Graefe extraction as the bases of our consideration of the subject, we will find in the diagram (Fig. I.) a graphic presentation of what most men set before themselves as the ideal incision. Puncture and counter-puncture 12 mm. apart and 2 mm. below the upper margin of clear

cornea, and the emergence of the knife at that margin, give a wound not very far from linear, *i. e.* lying in a great circle of the cornea, and having an outside length of about 13 mm. Begun with the plane of the knife parallel to the plane of the iris, the incision must be curved forward by the rotation of the edge of the knife as the section is carried upward towards the

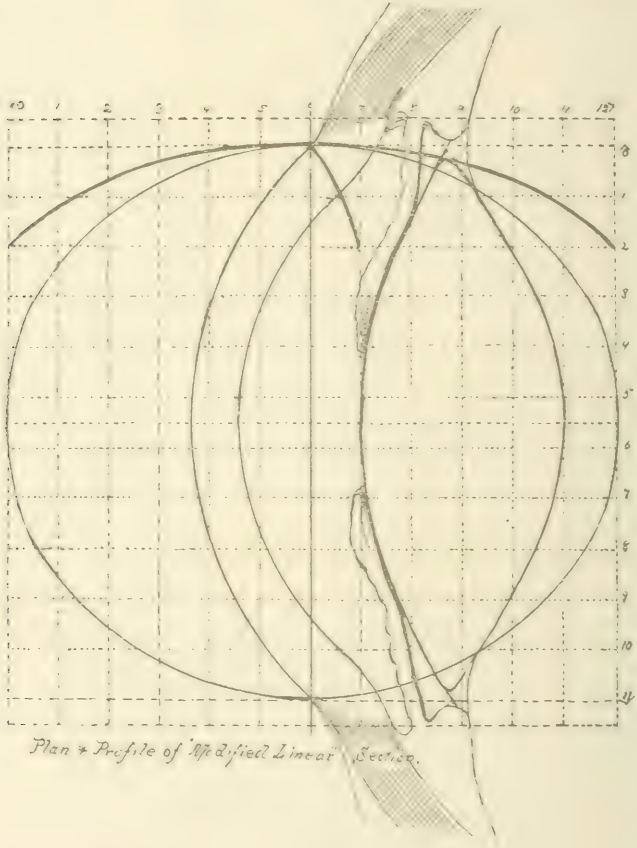


FIG. I.

cornéo-scleral junction; and, viewed in profile, the resulting wound is curved with its concavity forward. While this curving forward of the cut is not always achieved by a distinct turning of the edge of the knife, it is practically universal.

since the upward drag of the knife-edge changes the relation of the eye and the plane of the iris to the plane of the knife. The "Hohlschnitt," *i. e.* the curved section, is therefore the usual incision.

The construction of the Graefe knife permits of puncture and counter-puncture without any loss of aqueous; but, with the first movement towards the division of the bridge of tissue which remains to be severed, begins the draining away of this fluid, the pressing forward of the iris, and the diminution of the tension of the eyeball. A skilful hand can generally keep the knife-edge free of the iris, and can mitigate the violence done to the eye as the sawing section drags upon the flaccid cornea, stretched between the fixation forceps below and the knife above. The zonula will stand a good deal, and only occasionally ruptures, and thus early in the operation permits loss of vitreous. But these are variations in degree, not in kind, and the most skilful operator will not always escape awkward complications. Could he complete his incision without loss of aqueous, not only would it be impossible for the iris to engage the properly placed knife-edge, but the tension of the eyeball, maintained by the retention of the humor and increased by the addition of the knife-blade to its normal contents, would permit a smoother, cleaner section, which, like that of a lance knife, may always be expected to heal more kindly than a rougher one. Further, could the fixation of the globe be made largely or exclusively at the points of puncture and counter-puncture, close to where the incision is being completed, the drag upon the eye would be reduced to that incidental to the friction of the knife in the wound.

It is needless to urge that these advantages cannot be gained with the Graefe knife, but it is important to call attention to the fact that they are all most readily attained with the knife of von Jaeger (Fig. II.). A triangular knife, narrower than that of Beer, and curved on the flat with its concavity forward, will fulfil all the indications laid down by Arlt, while meeting the requirements for the perfecting of the incision. Increasing in size from point to heel, it always fills the wound; curved on the flat, it cuts forward as well as upward as it advances; and

the incision, begun parallel to the plane of the iris and as far back as the operator may prefer, may be brought out at any desired point inside or outside of the limbus, without any of that rotation of the blade needed for the Graefe, but impossible with so broad a knife. Further, the knife is a wedge, and the upward pressure of its edge is met by the counter-pressure of its rounded back, resting in the angles of the wound; and fixation of the eye by forceps is needed only to meet the forward pressure of the knife. Jaeger himself released the hold of his forceps after making his counter-puncture, and completed his cut without other fixation than that afforded by the knife itself.

In this connection the photomicrograph (Fig. 3, Pl. I.) of a section of an eye thus operated on by von Jaeger himself, will doubtless be of interest. It was removed about a year after the extraction, and through the kindness of Dr. F. Dimmer I had the opportunity of cutting it in the Laboratory of Prof. von Arlt, in 1883. The smoothness of the incision is evidenced by the perfection of the healing.

The point, therefore, of these remarks is to show that the "Hohlschnitt" of von Jaeger as I saw him perform it, and as I have since done it, does not essentially differ in any appreciable degree from the modified von Graefe incision now usually adopted; but that made with his knife it can be more perfect than is possible with the Graefe knife, however modified, and with the avoidance of many of the dangers which no skill can wholly separate from the use of the narrower knife. That the manipulation of the Jaeger knife is confessedly rather more difficult and nice than that of the Graefe—that the incision must be rightly begun or it cannot possibly be carried through to a satisfactorily result (as the Graefe sometimes

FIG. II.

may after a false start)—these points should surely militate most against an operator of small experience like myself, and be trivial to other members of this Society when weighed against great and manifest advantages.

DISCUSSION.

Dr. Knapp.—I have used Jaeger's knife, but I have not found in it the advantage which the doctor claims for it. The speaker says that it retains the aqueous humor better, and makes the whole section in cutting forward. It does so when guided to perfection; but, as far as my experience goes, it is more difficult to pass the larger knife through the anterior chamber than the small Graefe knife. The latter keeps back the iris better. With the Graefe knife it is possible to complete the section in one onward movement, but I do not consider this necessary.

Looking at the mechanism, we see that the broader the knife and the more lance-shaped it is, the more it approaches a chisel. Extraction with a Weber knife is very unpleasant. If the knife is not very sharp, the part where you cut is pressed in before the point reaches the opposite margin. The action is, as I have said, more like that of a chisel than that of a knife.

Dr. H. D. Noyes.—I agree with what has been said with reference to the facility of going through the anterior chamber with a narrow knife as compared with a triangular knife. The narrow Graefe knife gives far better control of the movements necessary in making a proper section than a knife of a greater width. I have adopted a little manœuvre in the use of the Graefe knife, and after practising this method for years, I find that the same thing is done by Prof. Panas, at Hotel Dieu, in Paris. The knife is entered, and after reaching the counter-opening, instead of being pushed forward in the same direction, the emerging part of the blade cuts the inner third of the wound, while the heel remains fixed at the place of entrance. The section is continued by elevating the handle and withdrawing the knife, and a central portion remains to be divided. Since I have adopted this manœuvre, I have never been troubled with rolling over of the iris upon the edge of the knife. I should not be willing to resort to a broad knife in preference to a narrow one in making the section for cataract.

DR. THEOBALD.—The facility of making the incision with a narrow knife has been referred to, but it has not been pointed out why it is easier to use the narrow knife than the triangular knife. When using the latter instrument, we are trying to do two things at once. We are not only passing the knife across the anterior chamber, but we are at the same time completing the corneal incision. This is a complicated manœuvre. With the Graefe knife, we pass it across the anterior chamber, and having selected the point of counter-puncture and transfixed the cornea, we then make the section, directing our whole attention to this point.

DR. RISLEY.—The difficulty which I have experienced in the use of this knife has been in making the counter-puncture; but the counter-puncture once made, there is a sense of security and ease in perfecting the section, which I have never experienced in the use of any other knife.

DR. RANDALL.—I have not found the knife very difficult to handle, being careful in laying out my incision to make the puncture where I wished, and to get the knife in the proper plane to begin with; which has to be done with a certain amount of care. I would again insist upon the perfect smoothness of the incision made in this way. It is as clear as that made with the lance knife. I think that if we examine the sections made with the Graefe knife, we shall not find them so smooth. As to the correction of a mistake, it is confessedly more difficult; but it can generally be avoided by laying out the incision properly in the first place. The point is this, that if the puncture is correctly made, the counter-puncture will be correct, however much the patient may move. I recently operated in a case in which the lens had been completely detached, falling back into the vitreous. It was a traumatic case, and the lens was quite freely moveable. I made the incision downward and outward, as the iris was there torn from its ciliary attachment. I got a perfectly smooth cut, and lost no vitreous whatever until with the loop I had brought out the lens. I could not have done this with the Graefe knife. In the hands of most men, I think that this knife will enable them, with a certain amount of skill in placing the incision, to make a perfect incision, where it would require a far more skilled and experienced operator to make it with the Graefe knife.

DR. GRUENING.—I see no reason why there should be any greater difficulty in making the counter-puncture than there is in making the puncture. The trouble is that the exact point of counter-puncture is not distinctly seen. Myopic opera-

tors have no difficulty in making either the puncture or the counter-puncture. The iris falls on the knife generally when the attempt is made to correct a misplaced counter-puncture. In my operations I use a pair of strong convex glasses, make myself myopic, and have no difficulty at present in placing the counter-puncture correctly.

CILIO-RETINAL OR ABERRANT VESSELS.

By B. ALEX. RANDALL, M.D.,
PHILADELPHIA, PA.

THE importance of the fact that the retinal vessels constitute as a rule a separate and independent system without anastomoses—a terminal system—has been often urged in its bearing upon the nutrition of that membrane in derangements of its blood-channels; and the occurrence of exceptions to this rule has been noted, especially by Nettleship[1] and Schleich,[2] with delineations of a number of instances; while the suggestion of the value of such anastomosis in case of embolism or thrombosis of the central vessels has been realized in the case reported by Benson.[3] Few cases of such vessels have been examined microscopically;[4] and Loring,[5] while citing cases of aberrant vessels that seemed to communicate with the choroidal vessels, states that such a communication has never been reported as actually observed with the ophthalmoscope in the normal eye. Further, most writers agree in stating that cilio-retinal vessels are rare, are almost invariably of small size, without notable branching, and almost without exception pass only to the macular region. As sketches of a considerable

[1] Royal London Ophth. Hospital Reports, IX. 2, p. 161.
[2] Mittheilungen aus d. oph. Klinik in Tübingen, I. 1. p. 131.
[3] "On a case of embolism of the central artery of the retina, modified by the presence of a cilio-retinal artery." Ophth. Hosp. Reports, X. p. 336.
[4] H. Müller A. f. O. IV. 2, p. 10; Nettleship, Ophth. Hosp. Reports, IX. 2, p. 161; Birnbacher, Arch. of Ophth. Mar., '87, p. 32.
[5] Text Book of Ophthalmoscopy, p. 104.

number of aberrant vessels are in the writer's portfolio, many of them conflicting with the above statements, it seems worth while to bring some of the more notable to the attention of the Society.

It may at first be remarked that most of the two dozen sketches in hand show the anomaly in a marked form, only the instances of strikingly large or otherwise peculiar vessels having been noted; and that they represent but a small fraction of the cases observed, since about one eye in every five examined shows some form of the condition in question. Only the striking instances, therefore, can be said to be rare. The vessels are more often small; but instances are not wanting where they are as large as the temporal veins or arteries or replace them, and where they branch conspicuously like the central vessels; and they may not only belong to other regions than that of the macula, but may even give branches to two different quadrants. So too as to their origin. Most of them doubtless arise from the short ciliaries directly, and pass either through the choroid ring or around its edge, without communication with the choroidal network; but others can be traced directly into the choroidal circulation. Such vessels can generally be seen most conspicuously, but their deeper course rarely determined, in the broad absorbing crescent of myopia; and their almost invariable occurrence in cases of the congenital *underlying conus* has been noted; but the cases here given had almost invariably hypermetropic refraction, and the eyes rarely presented any other noteworthy anomaly.

In Fig. 1 is shown the left eye of James K., thirty years of age, the coachman of Dr. Risley, by whose kind permission the sketch is used. The upper temporal vein[1] is seen to pass down nearly to the centre of the disc, where it is joined by a large macular vein and turns directly out into the choroid, in which it can be followed for a half disc-diameter. Its direct communication with the choroidal vessels is not visible, and can

[1] My original sketch shows this as an artery; but a note written upon it later, that the vessel is a vein, induced me to alter the drawing. Dr. Risley has since seen the case, and verifies the original sketch—too late, however, to enable me to correct the blunder.

only be inferred from its remaining upon their level as far as it can be traced. The refraction is hypermetropic astigmatism corrected by + 1 D. cyl. ax. 90°.

The other eye presented three small aberrant vessels rising through the edge of the disc.

In Fig. 2, representing the right eye of Emil A. M., aged thirty, with very low H. As., a large artery, springing from a choroidal vessel to the outer side of the disc, passes in through the head of the nerve and rises in the *porus* to become the lower temporal artery. The retina is striated and the smaller vessels tortuous; but there are no other notable abnormalities in either eye. The choroidal origin of this artery, though difficult to depict, is absolutely unmistakable.

Fig. 3 represents the right eye of Dr. T., aged sixty. The disc is rather small, round, and with absorbing crescents to both inner and outer sides; the retina is striated and the choroid disturbed in the periphery. H = .75. An artery as large as the upper temporal passes upon the disc from its temporal margin nearly to its centre, then curves downward and branching just before reaching the margin, gives one of its nearly equal branches to the upper macular region. The other passes down and out as the lower temporal artery, supplemented by a slightly smaller branch from the central artery.

In Fig. 4 is shown the right eye of Thos. S., aged twenty-five, where an aberrant artery of about the "third magnitude," after passing in upon the disc at its *nasal* side, bends outward with the usual curve, and branching just beyond the nerve margin goes to the lower and the upper median nasal sectors of the retina. The disc shows deep central excavation, and beyond the outer margin an irregular crescent of pigment absorption.

In Fig. 5, the left eye of Michael M., aged forty, is seen a large aberrant artery, arising at the lower outer margin of the disc at the edge of an *underlying conus*, and branching, after it has passed a half disc-diameter toward the macula, to be distributed to the upper and lower median retina. The lower branch is the larger, and after passing below the macula, again branches conspicuously. The disc presents a deep central

excavation, with the central vessels at its upper nasal edge, and is surrounded by a dark choroid ring, showing slight absorption out. The eye seems emmetropic.

Fig. 6, representing the right eye of John L., aged twenty, shows a large vein, apparently entering the choroid beyond the lower temporal margin of the disc, after passing in above the macula, from the upper temporal quadrant. There is a shelving excavation reaching nearly to the outer edge of the disc. The other eye presents an aberrant artery at the outer upper margin.

In Fig. 7, the right eye of Mrs. Kate K., aged thirty-two, an aberrant artery arises through the substance of the disc in the upper outer quadrant, to pass out above the macula. Below this a larger artery, which enters upon the disc from its outer margin, passes first down and then out with curious rectangular bends to become one of the lower temporal arteries. The disc is oval, its long axis at 75°, with a crescent out; and the refraction error was corrected by + 1. D. sph. ⌒ + .5 cyl. ax. 75°.

In Fig. 8, the left eye of Kate B., aged twenty-four, the optic disc is slightly horizontally oval, with a deep excavation shelving to its outer margin. There is a dark pigment crescent both to the inner and outer side, the latter showing some absorption. From beneath the centre of the outer crescent an aberrant artery arises, and apparently dividing just as it comes into view, abruptly sends one branch nearly directly outward; while the larger portion, winding in and then down and out through the excavation, passes to the lower temporal retina. In a closely similar case, not figured, the two vessels are in contact, and apparently united at the disc margin; but one curves up and the other downward to pass out into the retina widely separated.

A number of other less notable examples of aberrant vessels might be adduced;[1] but the foregoing seem abundant to prove that such vessels may occasionally be seen in direct com-

[1] Also cases, like that of Loring, where a large retinal vessel arises in the choroid and traverses the broad myopic crescent to gain the disc; or where in patches of choroiditis at a distance from the disc, direct communication is visible between retinal and choroidal vessels.

Fig. 3. Holdschnitt Extraction done by V. Jaeger. x20.

Fig. 2. Cilio-Retinal Artery. x20.

Fig. 1. Sarcoma of Eyelid—vertical. x9 diam.

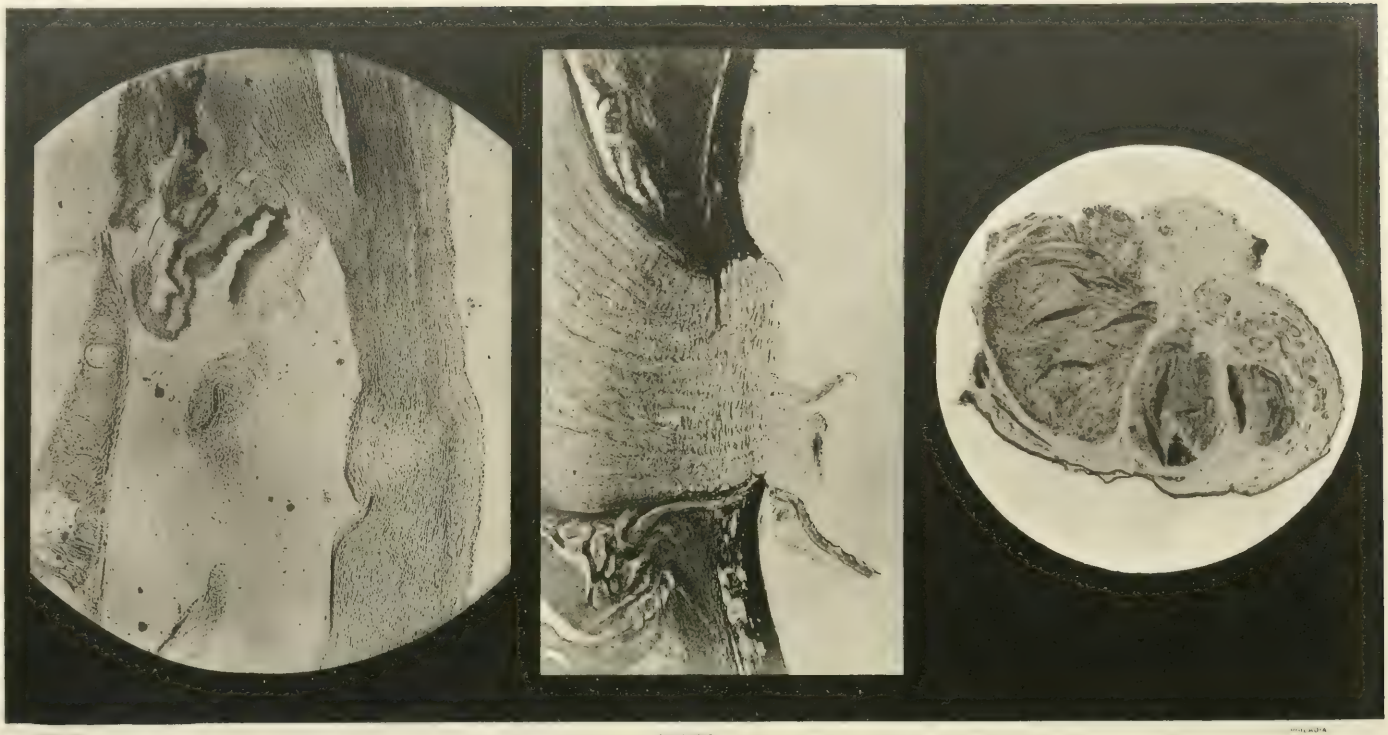


Plate I

munication with the choroidal circulation; that they may arise at the nasal as well as at the temporal disc-margin; that they may branch as conspicuously as the central vessels; and that these branches may pass to widely separated areas of the retina.

Through the kindness of Prof. Norris I have the opportunity of placing upon record one more case of cilio-retinal vessel studied under the microscope; and in Fig. 2 of Pl. I. illustrate one of the sections in his collection. The vessel, which study of this and other cuts prove to be an artery, is seen to pass in from one of the short ciliaries close to the sheath of the nerve and to rise *through* the choroidal ring and enter the retina. Injection of the vessels had been attempted before the eyeball was removed and the choroidal network is filled. The nerve is evidently œdematous and infiltrated—in the earlier stages of optic neuritis; but the notes of the case have been mislaid. The point has been raised as to Nettleship's case, and has the same bearing here, that in view of the presence of neuritis the vessel cannot be held to have pre-existed—a criticism that would have more weight had such a vessel ever been observed to form in any one of the thousands of cases of choked disc which have been watched with the ophthalmoscope through all stages of their progress.

SARCOMA OF THE EYELID, SIMULATING A MEIBOMIAN CYST.

By B. ALEX. RANDALL, M.D.,
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As a glance over ophthalmic literature shows few published cases having similarity to the following, and as its character was such that a mistake in diagnosis and treatment was very easy, it seems worth while to put this single case upon record, although its history is still incomplete.

John L., aged 41, visited the eye clinic of the Episcopal Hospital on July 22d, 1884, because of a small recurrent tumor near the margin of the right lower eye-lid, at the junction of the middle and outer thirds. It had been "removed"[1] by my predecessor in 1881, and again two years later at another Dispensary—each time being called "a cyst." It had now been present three or four months, increasing in size more rapidly of late. It was a smooth, rounded mass, as large as the half of a very large pea, situated in the substance of the lid, of yellow color, *obscurely fluctuating*, and presenting most of the characteristics of a Meibomian cyst. The conjunctiva was not involved; but the skin covering the growth was thinned, glazed, and not normally movable:[2] while one or two dark dilated veins were visible upon it, and a greyish tint, vaguely seen through the skin, arrested attention and suggested pigmentation. There was no glandular involvement or other suggestion of metastasis.

Thorough removal was advised; and was executed by a V-shaped incision through all the tissues of the lid. The wound margins were united by three deep silk sutures, leaving very little deformity in spite of the removal of full one centimetre of the lid-margin. The healing was kind; but with some nodular thickening not due to the sutures. He was informed of the nature of the growth at his visit one week after the operation, and directed to return in a month; but failed to do so.

The growth was cut with the freezing microtome, a few hours after its removal; and after staining in logwood, the sections were mounted and studied in glycerine. It was found to be solid, and to consist of four rounded nodules, sharply defined, and but little flattened by mutual pressure (Fig. 1, Pl. I.). The surrounding tissues seemed free from infiltration, except for small round cells only sparingly present and marking an encapsulation of the tumor; and the muscular bundles were merely pressed aside. The skin was thin, but not otherwise abnormal; the conjunctiva thick and

[1] Perhaps only incised and scraped.
[2] One if not both of the operations had been done through the skin.

with marked papillæ at the fornix. The tarsus was not involved, and in all sections examined showed normal Meibomian glands. The nodules themselves were composed of the large spindles of the typical large spindle-cell sarcoma. There was only one minute point of marked pigmentation, barely visible with the unaided eye; but some faint brownish pigment was scattered through the nodules. The growth extended from near the lid-margin downward through the entire extent of the sections, which showed little or no normal tissue below the lowest nodule, although the whole of this seems to have been removed.

The history given might suggest that we have here had to do with a sarcoma arising in a Meibomian cyst, as in a case reported by Samelson[1]; but the presence of a normal tarsus with healthy Meibomian glands in all the sections would indicate the contrary, and render it more probable that the tumor was sarcomatous from the first. In such a case it was noteworthy that a sarcoma, recurring after two removals, should be practically encapsuled, as was the case in the patient of v. Hippel,[2] and probably too in the successfully extirpated case reported by Aguilar.[3] As to the macroscopic appearances of the condition, it may be stated that the case had been set down as a recurrent chalazion by my assistants; and that only when the microscope had proved the correctness of my diagnosis, could I throw off the feeling that I had subjected the eyelid to an unnecessary mutilation—so little did the growth differ from an ordinary chalazion.

The patient returned on March 22d, 1887, with a recurrence which had been treated for months by a competent oculist with ung. hydrarg. ox. flav. The growth was now larger than before, and with a granulation mass on the conjunctival surface. The skin was thin and white over the conical outer portion of the tumor, but normally movable. Almost the entire outer half of the eye-lid was involved, but there was still no glandular complication. The growth was removed on

[1] British Medical Journal, II. p. 706.
[2] Bericht über d. Univ. Klinik zu Giessen, 1879–81.
[3] Recueil d'Ophthal., p. 620, 1882.

March 25th, by a V-shaped incision carried through tissues apparently perfectly healthy. The outer half of the lid was removed, and its place supplied by a quadrangular flap from beyond the outer canthus. The healing was prompt, but with some deformity. He was discharged from the hospital eight days after the operation, and has failed to return as promised. There was some fulness of the inner edge of the wound when last seen, that seemed to be increasing, and suggested a prompt recurrence. The second tumor proved a large spindle-cell sarcoma like the first, larger and less distinctly encapsuled.

HYPERMETROPIC REFRACTION PASSING WHILE UNDER OBSERVATION INTO MYOPIA.

By S. D. RISLEY, M.D.,
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THIRTEEN carefully recorded cases, in which eyes with hypermetropic refraction were observed to pass over into myopia, have already been published in the transactions of this Society.

To-day I bring forward an additional group of nine cases, making in all twenty-two published cases. In every instance the state of the refraction had been repeatedly demonstrated under complete paralysis of the accommodation. In every case there was present well marked retino-choroidal disturbance with asthenopia. Insufficiency of the internal rectus muscles was noted as present in three of the cases, in two of which tenotomy of the externi was performed. In no case was emmetropic refraction observed at any stage of their progress. *Without exception they passed from the too shallow, hypermetropic eye-ball, over into the lengthened myopic eye, through the turnstile of astigmatism.*[1]

[1] Case VI. furnishes a possible exception, as astigmatism was not sought for in the first examination.

The relatively large number of the cases in which a very low grade of refraction error was present, is a feature to which it is especially desired to direct attention, for the reason that these are too frequently either overlooked entirely or regarded as of no importance in the history of the case in hand. The pathological state of the eye ground and the severe asthenopia, it is true, often seem altogether out of proportion to the existing defect of refraction; yet when the marked relief which followed the use of correcting glasses is considered, it cannot reasonably be doubted but that the existing error of refraction, the symptoms and the existing pathological state, sustain to each other the relation of cause and effect.

In several of the recorded cases, the symptoms, at first relieved, returned only after the correcting glasses had been neglected or laid aside. In the notable case, presented in 1884, and published in the transactions of this Society for that year, we have a marked illustration of the truth of this statement. Recently, this case has presented a second demonstration of the importance of an accurate correcting glass. After quite three years of complete relief, and ability to use the eyes at will without discomfort, she returned, complaining once more of undue sensitiveness to light, fronto-occipital pain, and inability to use the eyes without aggravating the symptoms. Inspection revealed that the optician after repairing the frames had inserted the right glass so that the axis of the weak cylinder stood 30° from its proper position. The glass was correctly placed, and the symptoms promptly disappeared. Many of the cases before reported have been seen at intervals since the publication of the report, and show no change in the refraction. This is doubtless due wholly or in part to their greater faithfulness to their correcting glasses. As long as the refraction of the eye was hypermetropic they could secure sufficiently sharp distant vision without their glasses, and in some cases failed therefore to appreciate their importance; but having become myopic the glass was now necessary to secure accurate vision, and was therefore worn cheerfully, or at least without any sense of sacrifice, with the effect of preventing a further increase of myopia.

CASE I.—Susie B., aged eight years. November, 1877. Is brought for advice at the suggestion of her music-teacher, who had discovered that her inaptitude was due to her defective vision.

Examination revealed what appeared to be a mixed astigmatism in the right eye and compound myopic astigmatism in the left. There was beginning pigment absorption throughout the eye ground in both eyes, but no conus. After prolonged use of atropia solution—gr. iv.–f℥ i.—the refraction error was corrected by the following formula:

O.D. $+ 1.50_c$ ax. 105°.
O.S. $- 1.50_c$ ax. 165°.

Six years later, 1883, she came, complaining only of defective vision. There had been no asthenopia. The pigment absorption had advanced until the choroidal circulation was plainly visible throughout the eye ground; but there was no conus or other characteristic change about the region of the optic nerve. The balls, however, were found to have undergone a marked change in form, as indicated by the following correcting glasses:

O.D. $- 1.25_c \bigcirc - 3.50_c$ ax. 15°.
O.S. $- 4.50_c \bigcirc - 2.75_c$ ax. 150°.

There was no muscular insufficiency.

Two years later, 1885, she then showed no increase of the myopia or other change in the eyes, notwithstanding the fact she had in the interval steadily pursued her studies at school.

CASE II.—Aged fifty. Mrs. V. September, 1886. Severe attacks of fronto-occipital pain attended with nausea. Mrs. V. had been subjected to these attacks since childhood, but lately they had occurred more frequently, and were so severe as to keep her in bed a large part of the time.

O.D. V. $= \frac{20}{25}$.
O.S. V. $= \frac{20}{200}$.

She wears for reading $+ 1.25_c$ ax. hor. for each eye. These were ordered a few years before by a physician who had requested her to wear them constantly. They at first gave her

some relief, but soon blurred her sight for distance. She, however, continued to wear them for reading. The ophthalmoscope revealed well marked retino-choroiditis. A careful correction of the existing refraction error under a mydriatic was advised, but all treatment was deferred until the following January, 1887. A surprising change had taken place during these intervening months. In the right vision had sunk from $\frac{4}{5}$ to $\frac{1}{10}$ ($\frac{20}{200}$), and she could read only large type (Jr. No. 14). In the left eye vision remained as before, $\frac{20}{200}$. In neither eye could a clear ophthalmoscopic image be obtained with any spherical glass. The corneal image in both was greatly distorted. She was suffering greatly from pain in her eyes and head, dreaded exposure to the light, and her general nutrition was much impaired, but no organic lesion of any other organ was discovered, although diligently sought for. She was ordered iodide and bromide of potassium, internally, and sulph. hyoscyam. gr. ii.—f ʒ i. for the eyes, to be instilled three times daily, and smoked glasses to be worn when exposed to the light. After four days her suffering was greatly mitigated. The eye balls, especially the right, which had before been very sensitive to the slightest pressure, had lost their tenderness. Careful measurement resulted in the following formulæ for her correcting glasses:

O.D. + 1.50° ⊂ — 5. cyl. ax. 100°.
O.S. + 2.[illegible] — 5. cyl. ax. 80°.

With these, V. = $\frac{20}{40}$ with each eye.

These glasses were ordered for constant wear, and a formula for reading glasses based upon it also directed. The mydriatic was then omitted, but the internal medication continued. A month later she had had no attack of severe headache, and the deep seated ocular and periorbital pain from which she had constantly suffered was steadily becoming less severe, while sharpness of vision had increased to V. = $\frac{20}{25}$ in each eye. The following April. V. = $\frac{20}{25}$ +, and she could use the eyes for all purposes without pain. The eye-ground changes had quite disappeared, leaving, however, a semi-atrophic conus downward and outward in both eyes.

CASE III.—Harry V. Aged fourteen. Son of Case II. Came also in September, 1886. He complained only of indistinct vision, constant in the left and periodical in the right. The blurred vision in the right was only noticed after protracted use of the eyes at near work, rapidly clearing during brief intervals of rest:

O.D. V. $\frac{20}{50}$.
O.S. V. $\frac{10}{200}$.

The ophthalmoscope revealed a crescent of choroiditis, embracing the outer half of both nerves, and a flannel-red eye-ground throughout. There was apparently a myopic astigmatism in both. The solution of sulphate of hyoscyamine was employed three times daily, with the effect of dispelling rapidly the apparent degree of M. in O.S. On the fourth day he was given the following formula for glasses:

O.D. + .50$_c$ ax. 15°. V. $\frac{20}{20}$.
O.S. — .60$_c$ ⌒ — .25$_c$ ax. 75°. V. = $\frac{20}{20}$.

Nine months later the mydriatic was again employed, and the refraction once more carefully determined, with the following result:

O.D. — .50$_c$ ax. 105°. V. $\frac{20}{20}$.
O.S. — .75$_c$ ⌒ — .50$_c$ ax. 75°. V. $\frac{20}{20}$.

There was now a semi-atrophic conus at the site of the crescent of choroiditis above described, and there was extensive pigment absorption throughout the eye-ground.

CASE IV.—John B. Aged sixteen. November, 1885. Conus in both eyes. Accommodation-choroiditis, fronto-occipital pain. Refraction as determined under a mydriatic:

O.D. —.75$_c$ ax. 180°.
O.S. + .60$_c$ ax. 90°.

October, 1886, glass has been worn constantly, with entire relief; V. = $\frac{20}{20}$ with each eye. The glasses were then laid aside, except for near work, and were used irregularly. The following April, 1887, he returned, because of eye trouble and impaired distant vision. Mydriatic determination revealed the following change in the refraction of his eyes:

O.D. — .75$_c$ ⌒ — .75$_c$ ax. 180°.
O.S. — .60$_c$ ax. 180°.

Case V.—William L. Aged thirteen. 1885. Asthenopia, aggravated by work at near point:

O.D. V. = $\frac{20}{25}$ +.
O.S. V. = $\frac{20}{40}$ —.

In O.D. there is a circular atrophic patch near the fovea, but not invading it. In both eyes, commencing pigment absorption in lower half of eye-ground. There is apparently low grade of M. As. in both. After prolonged mydriasis and use of iodide of iron internally, the refractive error proved to be in O.D. + 25_c ax. 90°. O.S. — 50_c ax. 75°. V. remained $\frac{1}{1}$ for nearly two years, w' en he was allowed to lay aside his glasses, except for near work. In four months his former trouble had returned, and the error of refraction, as determined under a mydriatic, had increased, so that the following correcting glasses were required:

O.D. — $.25_s \bigcirc$ — $.25_c$ ax. 180°.
O.S. — $.50_s \bigcirc$ — $.50_c$ ax. 75°.

A total increase of .50 D. in each eye in four months.

Case VI.—Erwin S. Aged twelve. Was first seen in 1874 for an injury to O.S. It was then incidentally recorded that in the injured eye H. = $\frac{1}{16}$; in the sound eye V. = $\frac{20}{20}$, and oph. showed H. No record was made as to the presence or absence of astigmatism. In April, 1887, careful determination under mydriasis shows for

O.D. — $.50_s \bigcirc$ — $.50_c$ ax. 180°.
O.S. — $.50_s \bigcirc$ — $.50_c$ ax. 170°.

In this case there is in the most favorable meridian an advance of more than 2.50 D. The impaired vision had been noticed first about two years before the correction was made, but for many years he had suffered greatly from headache, aggravated by his employment—that of a book-keeper.

Case VII.—Louisa W. Aged fourteen. November, 1885:

O.D. + $.25_s \bigcirc$ + $.50_c$ ax. 90°.
O.S. + $.50_s \bigcirc$ + $.50_c$ ax. 90°.

Marked asthenopia, high insufficiency of interni, double tenotomy of externi. March 26, 1887, O.D. — $.50_c$ ax. 180°.

O.S. $+ 1.0_c$ ax. 90° ⊂ $- 1.0_c$ ax. 180°. June, 1884, entire relief from asthenopia.

CASE VIII.—A. H. (The notes of this case have been kindly furnished by Dr. George E. De Schweinitz, of Philadelphia.) March 15, 1886, insufficiency of interni = 5°. Correcting glasses determined under prolonged use of mydriatic:

O.D. $+ .50$ ax. 90° V. $\frac{20}{20}$.
O.S. $+ .25$ ax. 90° V. $\frac{20}{20}$.

These glasses proved useful in partially relieving the asthenopia; but in April, 1887, the eyes becoming increasingly troublesome, a mydriatic was again resorted to, and the following advance proved to have occurred. In

O.D. $- .50$ ax. 180°.
O.S. $- .25$ ⊂ $- .75$ ax. 180°.

In this case it will be observed that not only was there a decided increase in the length of the balls, but also increased distortion, since the astigmatism was distinctly greater in the now myopic eye than it had been in the hypermetropic state of the refraction.

CASE IX.—School-boy, afterwards student. (The notes of Case IX. have been kindly furnished by Dr. Charles A. Oliver, of Philadelphia.) It also clearly sets forth the opinion expressed in this and previous reports, viz. that the myopic eye is recruited from the eye with hypermetropic refraction.

Sept. 25, 1880:

O.D. $+ .65_s$ ⊂ $+ .25_c$ ax. 90°.
O.S. $+ .50_s$ ⊂ $+ .25_c$ ax. 90°.

Narrow, black, clearly cut crescent at temporal side of disc. Slight insufficiency of interni. May 29, 1883:

O.D. $+ .25$ ⊂ $+ .25_c$ ax. 90°.
O.S. $- .25$ ax. 90°.

It will be observed that in O.D. .25 D., while in O.S. .75 D. has been lost in all meridians. Three years later, June 25, 1886:

O.D. $- .25_c$ ax. 180°.
O.S. $- .25_c$ ax. 150°.

Thus in six years the eyes have become myopic in one meridian, and in O.S. the principal meridians have shifted 30°. The change in the refraction of the eyes was also accompanied by the characteristic pigment absorption in the eye-ground.

It is a fact of great importance that in all of these cases the treatment had for a time alleviated the symptoms. In Cases IV. and V. the arrest of the process had been complete as long the glasses were worn constantly. In many of the other cases the renewed onset of trouble could consistently be ascribed to some definite cause—*e.g.* badly fitting glasses, so that the axis of the cylinder no longer coincided with the principal meridians of the cornea, or the patient had been irregular or careless in the use of the glasses. In one case the glass had been inverted by the optician in replacing it after repairing the frames.

I might have selected from my case-books a very large group of patients who have been spared by treatment the result seen in these reported cases. To me it is no unusual occurrence to have young persons, whose error of refraction I had before corrected, return with diminished sharpness of vision in one or both eyes, due in all probability to tonic action of the ciliary muscle, since it promptly disappeared under rest, which was frequently enforced by mydriasis or by simply removing the cause of irritation, which not infrequently is a badly fitting pair of frames. That the correcting glass is the most important item in the treatment of these cases is, I think, shown by such examples. When I recall the very large number of patients who have presented themselves with asthenopia, presenting at the first in all respects the same conditions as in the cases made the subject of this report, but who have subsequently had no return of their trouble nor shown any tendency to eye-ball distension, I can but think that the group of cases now presented are only those in which the treatment had failed—that without their correcting glasses a very much larger number would have pursued the same history. When I recorded the first group of cases in which I had observed the change from H. As. to M. As., my motive

was simply a contribution to the history of the myopic eye. Incidentally the study has demonstrated (to me) the importance of astigmatism, even when present in very low degree, as a factor in setting up those changes of nutrition in the eye ball which result in impaired resistance to even normal intraocular tension. Case II., aged fifty, shows that these changes are not necessarily confined to young eyes.

DISCUSSION.

DR. SEELY.—I should like to ask what was the balance of the muscles in these cases, and how much stress the doctor puts on disturbance of the balance of the muscles in the change of the eye? Also, if where the astigmatism changed to minus, its axis was not exactly the reverse of the plus? It has seemed to me for many years that perhaps one of the chief factors in the production of myopia was a lack of balance in the muscles, not necessarily insufficiency of the internal muscle, but of other muscles.

DR. RISLEY.—It has been my routine habit to measure and record carefully the muscular balance. This is a part of the examination in every case not inflammatory. In the entire group of cases presented there were only three in which there was a notable degree of insufficiency of the internal rectus muscles. In many of these cases, there seems to be more or less irregular movement or lack of harmony between accommodation and convergence of the eyes, but a measurable degree of insufficiency was not present except in the three cases noted. In two of these tenotomy of the external rectus muscle was performed, while in the other special reading glasses were given with prisms with their bases turned inwards.

I have never been able to rid my mind of the belief that there is an important connection between muscular balance and the nutritional changes which result in distension of the eye-ball, but I have never been able to get a clear demonstration of the exact relation between the two. As my convictions now stand, the important element in the ætiology of the cases described in my paper is the existing astigmatism.

DR. KNAPP.—I would ask Dr. Risley if he has paid attention to the correcting influence of the ciliary muscle in astigmatism. It is stated that astigmatism which is lenticular is partially corrected by voluntary action of the ciliary muscle. I have had no experience on this point.

Dr. Seely.—I think that I have seen such cases, where an individual's eyes were capable of correcting astigmatism amounting to 1 D. or 1.5 D.

Dr. Burnett.—There is an astigmatism of the lens which can be brought about by partial contraction of the ciliary muscle. For a long time I doubted this, for I did not see how there could be a limited contraction of a circular muscle. From the observations of Dobrowolsky, Javal, and others, there can be no doubt that there is a correcting influence of the lens by partial contraction. This can only be demonstrated thoroughly by measuring the radius of curvature of the cornea and paralyzing the ciliary muscle. It is undoubtedly a fact that astigmatism as high as 1.5 D. has been corrected by this partial contraction of the ciliary muscle. Whether or not that would have any effect upon the production of myopia is a question open to discussion. My opinion is that it would be one of the factors, but that it is a factor more strongly operative in the production of myopia than contraction of the ciliary muscle as a whole, I am inclined to doubt.

Dr. Randall.—I have seen several cases of very marked increase of the astigmatism after the use of a mydriatic, where at first there was a low degree of astigmatism. This was manifestly increased and brought into accord with the corneal astigmatism.

Dr. Knapp.—The conditions spoken of in the discussion are not what I had reference to. I want to know whether or not there is an astigmatism which the patient can cause to disappear by a voluntary effort.

Dr. Norris.—With reference to the ability to see horizontal or vertical lines more distinctly, every case of hypermetropic astigmatism shows you that, if there is any degree of irritation, it is impossible to pin the patient down to a correct statement.

Dr. Carmalt.—I confess to some surprise in having this question brought up in this Society, for I have met the condition so frequently that I supposed it was an every-day occurrence with every ophthalmologist. I did not suppose that there was any doubt that the ciliary muscle will contract irregularly, and frequently correct or simulate an astigmatism. I have found it so frequently that I took it as a matter of course, and it is one of the most frequent reasons why I instil atropia to get the true state of the refraction. You must all have met instances in which apparent astigmatism is reduced under a mydriatic to hypermetropia, and again a myopic astigmatism in one meridian without atropia reduced

to hypermetropic astigmatism in the opposite meridian with atropia; and I am also sure that I have met cases of real astigmatism where a correction was produced by irregular action of the ciliary muscles, and I did not get at the true error of refraction until the ciliary muscle was paralyzed. I know that I use atropia more frequently to overcome irregular ciliary action than I do to get H. as distinguished from Hm.

DR. SEELY.—As I understood Dr. Knapp, the question was an entirely different one from that which we have been discussing. I do not mean that this correction is under the control of the will. In the case which I referred to, the eye itself, independently of the patient's will, corrected its own astigmatism. He could go for a while without the use of glasses, and see in a normal manner. Then astigmatism would reappear. Glasses then had to be used. After a time the glasses could be left off, and the vision continue normal. He could not do this at will. I agree with Dr. Carmalt as to the frequency with which the astigmatism is concealed. There can be irregular action of the ciliary muscle. While upon this subject, I would say that I have never to my knowledge seen a pure case of mixed astigmatism. The minus part was always assumed, and did not belong to the individual. As a rule, I have either obliterated the minus astigmatism or changed it so as to have it added to the plus side by the use of mydriatics. I have, however, seen cases where I was obliged to prescribe for the mixed astigmatism, but I had obliterated so much of the minus part that I regarded the other as acquired.

DR. THEOBALD.—I would state that in my own case, I have the power of involuntarily changing from moment to moment the amount of my astigmatism. I have myopia and astigmatism; axis nearly horizontal. It makes no difference, so far as the vision is concerned, whether I give myself a weak cylinder and a strong spherical glass, or the reverse. With 18_s and 30_c, I can see the line tests and the letters perfectly. With 15_s and 48_c, the result is the same.

DR. BURNETT.—There is a practical application of this to which attention has not been called, and that is, that the astigmatism may differ for distant and for near work. Although the eye may be emmetropic for distance, yet the action of the ciliary muscle may be so irregular that there may be some astigmatism when accommodation is called into play. I have seen cases with differences in the astigmatism for far and near vision, and other cases where a cylindrical lens gave better vision for near work than did the ordinary spherical glass, but where cylinders were not indicated for distant vision.

Dr. Risley.—In reply to Dr. Knapp's question regarding irregular contraction of the ciliary muscle, I am not sure that such irregular contraction occurs, or if it does, that it makes the lens a compound one. That in a few instances we find astigmatism when the pupil is dilated and the accommodation paralyzed, which afterwards disappears in part, cannot be denied. It is also true that under the use of the mydriatic considerable degrees of astigmatism disappear. It is probable that these temporary inequalities of the refraction are to be accounted for by the pressure of the eye-lids, which may readily be caused by their weight when inflamed, or by their muscular action cramping the ball in the endeavor to exclude the light from eyes unduly sensitive to it.

We see this possibility illustrated in the case of the myope pressing the balls between the partially closed lid to secure better distant vision. Under the action of the lid pressure the vertical meridian has its radius of curvature still further shortened, while the horizontal is lengthened; the M. in this meridian being thus wholly or in part neutralized, while the vertical meridian is largely cut off by the lids.

With reference to the point alluded to by Dr. Burnett, that there might be a difference in the degree of astigmatism in near and distant vision. This might be brought about in eyes with delicate sclerotic coats by drawing them down and in, in the act of looking at a near object, the curvature of the ball being increased so as to temporarily change the refraction. I have never observed such a change. Only after complete paralysis of the accommodation can we secure a correct statement of the refraction of the eye. To me this is a condition of rest, and to it all other states of refraction should be referred for comparison.

Dr. Knapp.—That astigmatism can be changed by pressure, I am willing to admit, but I beg leave to differ from the view that the pressure of the lids has a great deal to do with it. The doctor says that the greatest curvature for near-sighted eyes is in the vertical meridian. I should like very much to know how this greatest curvature in the vertical meridian can be diminished by the pressure of the lids. It would be increased. It has been claimed that in the development of the eye the pressure of the lids causes the astigmatism.

NOTE ON THE INCREASE OF BLINDNESS IN THE UNITED STATES.

BY LUCIEN HOWE, M.D.,
BUFFALO, N. Y.

I DESIRE to call attention of the Society as briefly as possible to a few facts concerning the increase of blindness in this country, according to the United States census:

The population in 1870 was . .	38,558,371
And the number of blind then was . .	20,320
Whereas in 1880 the population was .	50,155,783
And the number of blind was . . .	48,929

In other words, while the population had increased 30.09 per cent. the number of blind had increased 140.78 per cent. Next I would call attention to a rather interesting fact in regard to the distribution of the blind. If the United States be divided into three parts according to latitude, the first or southerly range of States including those which lie below the 35th parallel; the second range between the 35th and 40th; and the third above, we find that there is a constant increase in the ratio as we pass from the north toward the south. Thus we find there are:

In the northerly range of States	7.9	blind in each	10,000
" " middle " " "	9.42	" "	"
" " southern " " "	10.81	" "	"

This gradual increase in the number of blind as we pass from a north to a south latitude is no new discovery, except as far as the United States is concerned; it is simply an exemplification of a law which was formulated by Zenue, and afterwards more fully elaborated by Carreras-Arago. These and other observers have mapped out the geography of blindness, so that the conditions of its existence and increase in different countries are definitely determined.

There is another classification of the States, which is also of some interest. If they be divided according to longitude into three groups, each of which includes about fifteen degrees, we find the proportion of blindness decreases as we go from east to west. According to this division the first group of States would lie between the Atlantic Ocean and the Mississippi River, extending to about the 15th degree of longitude west from Washington; the second would be from the Mississippi to the Rocky Mountains, or from the 15th to the 30th degree; while the third would include the strip from the Rocky Mountains to the Pacific Ocean, or from the 30th to the 35th degree of longitude west. Here we find:

In the easterly range of States .	10.34	blind to each, 10,000
" " middle " " " .	7.00	" " "
" " western " " " .	5.08	" " "

This comparison is of importance, in showing that the greatest proportion of blindness is nearest the centre of density of population, and also nearest that portion of the country where immigration would be apt to exercise the most influence upon the native population.

In view of these rather startling assertions in regard to the increase of blindness, it is natural that one should question the correctness of the data which lead to any such conclusions,—in other words, suspect that the apparently rapid increase was due to the difference in the manner in which the statistics were collected in 1870 as compared with 1880. In the compendium of the tenth census it is stated by Mr. Wines, who has charge of that department, that the plan was essentially the same, but in order to satisfy myself more thoroughly, a letter was addressed to the Secretary of the Interior, asking for any additional facts in regard to this point; but I was informed that the same outline was followed in the one case as in the other, and in general the same course was pursued, simply a special blank being filled out in 1880. Of course these examinations were by no means as accurate as would be desired from the ophthalmological point of view, for the enumerators were often ignorant and careless men. But the fact remains that the errors were probably as great in 1870 as in 1880.

Moreover, in order to verify the accuracy of some of the figures given in the last census, I made application for the returns regarding the city of Buffalo, and while a number of changes of residence were made, and it was difficult to verify the report in detail, still, the information obtained, as far as it went, showed that at least that part of the report was quite as reliable as could be expected. To sum up the statements, as far as the statistics are concerned there seems no escape from regarding them quite up to the average of reliability in showing that the blindness in this country has increased more than four times as rapidly as the population.

The importance of these figures might be considered from several points of view besides that of the oculist or the philanthropist. I may briefly indicate their significance to the economist, in the annual cost for supporting this army of more than fifty thousand blind in 1887. Supposing that they are all provided for in an economical manner, such as can be done in large institutions, it is fair to estimate the cost of keeping each one at

$2.00 per week, or . . .	$104.00 per year
To which should be added for clothing	28.00 " "
Or a total cost of	132.00 " "

These are the figures given in the report of the Perkins Institution and Massachusetts Asylum for the Blind, in October, 1874. It must be remembered, however, that these individuals are not producers, they do not earn what they otherwise would, and this amount must be added to the cost. Taking the lowest estimate of a man's wages at $1.20 for each working day, supposing that not one of all the thousands could become a skilled artisan, and counting the wages of the woman at only forty cents a working day, we find there is a total yearly loss to the community, cost and wages:

For each man, of	$404.00
And for each woman, of	256.00

This at the very minimum estimate amounted in 1880 to $16,383,272, and if anything like the same increase continues it amounts to considerably over $25,000,000 in 1887.

The foregoing data merely give an outline of the condition

of affairs in respect to this matter. As it is impossible in this preliminary note even to enumerate the various causes which have tended to produce such results, suffice it to say, examination shows that in the United States—as has been proved by Magnus for Germany—blindness is largely due to contagion.

The importance of a more extended inquiry into the subject cannot be questioned. Moreover, the causes of purulent and granular conjunctivitis—which are undoubtedly two of the chief factors in the production of blindness—can best be studied by noting in different countries the relation borne to these diseases by climate, race and hygienic conditions, especially in the light of recent bacteriological discoveries; and it would, therefore, seem highly desirable that a committee be appointed to investigate the subject with regard to these influences.

DISCUSSION.

Dr. H. D. Noyes.—It might have been well if Dr. Howe could have included the statistics of Cohn, with reference to the proportion of the various diseases of the eyes, taking a large number of cases. Cohn shows that the ratio, taking 300,000 cases, is conjunctival disease 30%, inflammation of the cornea 31%. That gives a fundamental fact to start upon from a large number of figures.

I would call attention to the fact that the enormous increase of blindness in the case of certain States shows itself conspicuously in the Western States, noted for their mineral productions. It is likely that a large part of this increase is due to accidents, and in these States it is often difficult to secure skilled treatment. The subject of injuries and accidents to the eyes is one of the points to be brought out.

Dr. Harlan.—The uniformity in the proportion of cases of conjunctival disease is quite remarkable. Some twelve years ago I examined the eyes of about one hundred and sixty inmates of a blind asylum. The proportion of cases in which the cause of blindness was purulent ophthalmia, nearly all ophthalmia neonatorum, was about one fourth.

Dr. Burnett.—I have been much interested in the statistics of Dr. Howe, particularly those with reference to the

great per centage of blindness in the southern portion of the United States as compared with the middle and more northern portions. This brings up an interesting question—the question of race. The larger part of the population of the Southern States consists of negroes, and of course the larger part of the blindness must fall among that race. It has been my experience that the negro does not suffer to any considerable degree, if at all, from trachoma. In an observation of several thousand cases of eye disease among the negroes, I have seen only one genuine case of trachoma, and in this instance the patient was a mulatto, so that this conjunctival disease, which may cause a large part of the blindness in other races, must be thrown out when we come to consider the causes of blindness among the negroes. While negroes have almost complete immunity from trachoma, they suffer a great deal more from scrofulous diseases of the eye, particularly affections of the cornea, than do the white race. The larger number of the cases of blindness in the negro that I have seen have been due to corneal opacities, the result, not of trachoma, but of primary keratitis dependent upon mal-nutrition of the cornea itself. The negro also suffers from ophthalmia neonatorum, and many cases of blindness from that cause have come under my notice.

The subject which Dr. Howe has brought up is one of great importance, and I was astonished to learn that the facts were as he set them forth. I think that this matter is worthy of further consideration in the form of a Committee of Investigation.

DR. MITTENDORF.—I am not at all surprised to learn that blindness is on the increase. I think that a most prolific cause is the crowding of young persons into institutions. An examination of some of the institutions in the neighborhood of New York has revealed an amount of contagious ophthalmia existing in those places, the existence of which was not known, or neglected by the officials in charge. We meet in our out-dispensaries and hospitals, almost weekly, persons who have become blind just from neglect or from contracting a disease of this kind in charitable institutions.

I think it must be very difficult to get an exact idea of the number of blind persons. A great many blind children are not counted in these statistics. They are kept at home by their parents and provided for, if they are able to do so. I firmly believe that one of the most important steps to take is to stamp out the contagious eye diseases from these institutions, and the best means to do this is to prevent over-

crowding. Instead of having large buildings in the city the children should be sent to the country and placed in small cottages, the way it is done at the country branch of the "New York Nursery and Child's Hospital."

DR. CALLAN.—Dr. Howe's paper has interested me very much. The whole point turns upon this, What can we do? We are backward in that respect as compared with other countries. In London there is a society for the prevention of blindness, which does good work. These cases of blindness are often due to neglect, and often to the applications made by the parents or others in cases of ophthalmia neonatorum. Poultices are often applied, and this is a frequent cause of blindness in these cases.

Should not we in every State organize Societies and instruct the people what they should not do, and that they should consult those whose business it is to treat diseases of the eye; do as the London Society does, issue tracts, and educate the people up to what they should do and what they should not do?

DR. STANDISH.—I would refer to the method in which the disease is brought to this country. I have charge of a clinic in South Boston which is much frequented by the Irish. There it is a common experience to find that the most acute cases of trachoma occur in individuals who have been in the country but a few weeks, and that when they landed they were just in the condition to spread the disease to those with whom they came in contact.

THE PATHOGENESIS OF PTERYGIUM.

BY SAMUEL THEOBALD, M.D.,
BALTIMORE, MD.

ALTHOUGH the question of how best to treat pterygium has, from time to time, received considerable attention, but little effort seems to have been made to throw light upon the mode of origin of this by no means uncommon affection. Having had occasion recently, in preparing an article upon pterygium for the forthcoming volume of Wood's Hand-book of the

Medical Sciences, to examine the several theories which have been proposed regarding its pathogenesis, I could not but be impressed with the inadequacy of each of them.

It is manifest that any theory which would satisfactorily explain the origin of pterygium must not lose sight of, indeed must account for, the fact that this growth rarely, if ever, makes its appearance except directly over one of the recti muscles, and, besides, that it is not found with equal frequency over each of these muscles, but in a very large majority of cases is in relationship with the rectus internus. This, however, the theories heretofore advanced fail to do. Take, for example, Arlt's theory, which has been very generally accepted, that pterygium has its starting point in an adhesion between swollen conjunctiva and a marginal corneal ulcer. It is manifest that, if this were the usual method of its production, since marginal ulcers of the cornea are not appreciably more frequent in one direction than in another, we should find pterygia approaching the cornea from every possible direction, and certainly bearing no constant relationship to the position of the recti muscles. The more recently proposed theory of Poncet, that pterygium is a parasitic disease, and that its advance upon the cornea is due to the presence of microbia—parasitic "vibriones" (sic)—which are supposed to tunnel their way beneath the corneal epithelium, is, of course, open to the same objection. Moreover, it is to be remarked that pterygium does not, as a rule, begin to form exactly at the corneal margin, but, on the contrary, that it frequently attains considerable size before its apex has even reached this point, and, therefore, before the ulcerative process (which Arlt and Poncet agree in regarding as the starting point of the affection) could possibly have played any part in its formation. Such being the case, it is evident that we must seek elsewhere for the primary cause of pterygium than in diseased conditions of the cornea.

It has long been taught that the development of pterygium is favored by conditions which produce persistent hyperæmia of the conjunctiva, as, for example, when the eyes are exposed to the heat of a tropical sun, especially as in long sea

voyages, or to the heat from furnaces, as is the case with stokers and founders, or to the irritant action of dust and vapors, as in certain manufacturing establishments; and the evidence in favor of this view is much too strong to be put aside. It is certain, however, that it frequently occurs without the eyes having been subjected to such unusual conditions; and, moreover, though this explanation of the origin of pterygium might account for its seldom making its appearance above or below the cornea, since in these situations the conjunctiva is more completely protected by the lids from external irritants, it would not account for its occurring so much oftener upon its nasal than upon its temporal border. Assuming, however, that persistent hyperæmia of the conjunctiva is an important factor in the production of pterygium, are there reasons why this condition should occur especially to the nasal side of the cornea—where pterygium usually makes its appearance?

Although the constant relationship between the location of pterygium and the position of the recti muscles, to which reference has been made, would seem to suggest that there is some connection between the two, I am not aware that this idea has been advanced heretofore. It seems to me highly probable, however, in view of the intimate connection between the vascular system of the recti muscles and that of the conjunctiva in the neighborhood of the corneal border (anterior conjunctival vessels of Van Wœrden), that these muscles, by influencing the blood supply of the over-lying conjunctiva, do, in fact, play a most important rôle in determining the formation of pterygium. Supposing that such is the case—that the determination of blood to the recti muscles tends to promote a hyperæmic condition of the over-lying conjunctiva, and that this in turn leads to the development of pterygium—it is manifest that of all the straight muscles the interni would exert by far the most decided influence in this respect; for, they are not only the largest, and the most active, but they lie in closer relationship with the conjunctiva than any of the others, since their attachment to the sclerotic is nearer to the corneal border. Thus we have, at once, a satisfactory expla-

nation of the fact that pterygium occurs in so large a majority of cases to the nasal side of the cornea.

In support of this view of the causation of pterygium, I may mention, as a matter of observation, that persons who suffer with this affection not infrequently complain that the pterygium itself, and the conjunctiva in its neighborhood, become bloodshot when the eyes are much used in near work.

What the especial conditions are which bring about this state of localized hyperæmia of the conjunctiva in some eyes, rather than in others, remains to be shown. In some instances it is, perhaps, due to peculiarities in the distribution of the blood-vessels of the muscles and conjunctiva; but, in a greater number, I am inclined to think, it is dependent upon conditions which disturb the normal relationship between accommodation and convergence, and thus render binocular vision difficult, such as insufficiency of the internal recti muscles and the several varieties of ametropia. I must confess, however, that, as my attention has only recently been directed to this point, I have, as yet, but little clinical evidence to offer in support of it.

DISCUSSION.

DR. ROOSA.—With reference to the subject of pterygium, it seems to me that the explanation given is inadequate. We might possibly make a combination theory of that of Arlt and that of Theobald. In my experience the large proportion of cases of pterygium present a history of traumatism which would produce ulceration of the over-lying conjunctiva according to Arlt's theory. A large proportion of cases occur among farmers, and in some cases they have been able to date the beginning of the pterygium from an injury from a beard of grain. In the case of stokers we also have occasion for traumatism.

It seems to me that the kind of inflammation described by Dr. Lippincott, or localized congestion, would never lead to the proliferation of tissue which is characteristic of pterygium. The position of the lesion is the only point on which the theory of Dr. Theobald seems to have a footing. It seems to me that it must be a combination of the theory of Theobald

and that of Arlt. We must presuppose something more than congestion over the muscle. We must presuppose swelling of the conjunctiva and ulceration.

DR. THEOBALD.—With reference to Dr. Roosa's criticism, I would say that there is no doubt that in certain cases pterygium is due to traumatism. I have had such cases myself, and I am sure that injury of the conjunctiva or cornea with subsequent adhesion of the conjunctiva to the cornea is one of the causes of pterygium, but it is only an exceptional cause. In my experience, cases of pterygium produced in this way are not in the usual position—over the internal rectus muscle. In one case the pterygium came from the inner and lower portion of the conjunctiva. In another case it came down from above. This latter case was due to purulent ophthalmia and corneal ulcer. The large majority of ordinary cases of pterygium, however, at least 90%, are situated over the internal rectus muscle. Traumatism will not explain the location of these cases, and corneal ulcer will not explain it. If these were the usual causes of pterygium, we should find it approaching the cornea from every direction. I think it is manifest that something entirely beyond the idea of corneal ulceration must be accepted to explain the development of pterygium.

Furthermore, the objection of Dr. Roosa that persistent hyperæmia would not account for the condition, is hardly well taken. We do not know enough about these processes to say that a constant over-supply of blood to the conjunctiva may not produce such a growth. A still further objection to the theory of Arlt is that the pterygium can be recognized before it reaches the corneal margin.

DR. LIPPINCOTT.—I think it is generally admitted that persistent hyperæmia may result in hypertrophy of the engorged parts. An illustration is seen in the enlargement of the calf of the leg which sometimes follows thrombosis of the femoral vein. Dr. Theobald's theory of the pathogenesis of pterygium is therefore at least plausible. If I understood Dr. Roosa correctly, that he has not infrequently observed cases similar to those described in my paper, I should be inclined to regard his experience as strongly confirmatory of the conclusion reached by Dr. Theobald.

A CASE OF RECURRENT RETINAL HÆMORRHAGES, FOLLOWED BY THE OUTGROWTH OF NUMEROUS BLOOD-VESSELS FROM THE OPTIC DISC INTO THE VITREOUS HUMOR.

BY SAMUEL THEOBALD, M.D.,
BALTIMORE, MD.

MRS. X., fifty-two years of age, of plethoric habit, and who had experienced occasional attacks of giddiness and flushings of the face since the cessation of menstruation, which had occurred not long before, called to see me on April 12th, 1886, because of a sudden change which she had noticed in the vision of her right eye. She had previously been under my care, having suffered with asthenopia, attended by hyperæmia of the conjunctiva, for which I had prescribed distance and near glasses, she being hypermetropic as well as presbyopic, and having $\frac{1}{60}$ of astigmatism and less hypermetropia in the right eye. About three months before the date mentioned, the conjunctiva of the right eye had become suddenly injected, and occasional pains had been felt in this eye. The patient also complained, at this time, of intermittent obscurations of vision, which she was inclined to connect with attacks of indigestion from which she suffered, and for which pepsin and bismuth were prescribed. The hyperæmia and other symptoms of this attack disappeared in a short time, however, under simple treatment.

Upon making an ophthalmoscopic examination on April 12th, several small hæmorrhages were discovered in the retina of the right eye, in the neighborhood of the optic disc. Examination of the urine, which was at once made, gave a negative result; the heart also was pronounced healthy by competent authority. The treatment instituted was the application to the temple, twice a week, of the artificial leech,

and the administration three times a day of hydrarg. bichlorid. gr. $\frac{1}{24}$. For a few days the changes in the fundus of the eye became more pronounced, especially above the disc, the retina in this region becoming œdematous and the central vessels distended and tortuous, while the extravasation of blood increased, extending forward towards the equator of the eye. The diagnosis was thrombosis of one of the superior branches of the central retinal vein. The region of the macula was at no time seriously involved, the vision of the affected eye, at its worst, being $\frac{20}{50}$(?)

There was nothing unusual in the behavior of the eye after this first hæmorrhage. The condition of the retina slowly improved, and the extravasated blood gradually underwent absorption. The patient was seen June 1st by Dr. Charles S. Bull, who wrote me that he was inclined to accept my theory of venous thrombosis as the cause of the trouble. By his advice she was given for some weeks small doses of tinct. digitalis (gtt. iij.) and ergotine (gr. j.), three times a day. During the second week in July she left Baltimore to spend the summer at Bar Harbor, Me. By this time the vision of the right eye had improved to $\frac{20}{40}$(?) and ability to read J. No. 1. About the 1st of August, a change occurred in the vision, and Dr. H. Derby, who was at Bar Harbor, made an ophthalmoscopic examination, and, as reported, discovered three fresh retinal hæmorrhages.

The patient having returned to Baltimore, I examined the eye on August 30th, and found it in every respect much better than when I had last seen it; only slight traces were discoverable of the former hæmorrhages, and vision had improved to $\frac{20}{20}$(?). On September 30th, however, a small fresh hæmorrhage (flame-like in shape) was discovered just below the disc. By October 30th, this had nearly disappeared, but she then complained of seeing a dark object, which had suddenly made its appearance before the right eye. The ophthalmoscope showed a globule of blood, having a diameter about equal to that of the disc, suspended in the vitreous humor, a short distance in front of the retina, and a little below and to the inner side of the papilla. V. = $\frac{20}{50}$(?). By the middle of November hardly a trace was left of this clot.

On January 3, 1887, vision was again $\frac{20}{20}$(?), and the condition of the fundus had still further improved; but there was complaint of recent neuralgic pain about the right eye, and on the 20th of the same month I discovered several fresh hæmorrhages—one in the retina near the disc, and another in the posterior part of the vitreous humor. There were also in the vitreous humor, above the disc, several string-like opacities of brownish color, evidently the remains of other hæmorrhages. The artificial leech was again employed, and the bowels regulated by aloin pills; and vision, which had declined to $\frac{20}{50}$(?), rose by February 22d to $\frac{20}{20}$(?).

On March 5th, a crescentic opacity was seen in the vitreous humor, just in front of the disc. March 26th, vision being still $\frac{20}{20}$(?), a reddish, nebulous, floating opacity was noted in front of the disc. Ergotine, gr.ss., three times a day, was resumed. April 20th, floating opacities in the lower part of the vitreous humor were observed, and the reddish opacity in front of the papilla, which had increased in size, was found to contain numerous fine blood-vessels, which ran forward, parallel with one another, from the neighborhood of the disc margin towards the centre of the vitreous. At this time the optic disc was nearly hidden from view by this singular growth, which consisted, apparently, simply of a mass of small blood-vessels, held together and supported by semi-opaque tissue, which presented a smoky appearance in contrast with the surrounding vitreous humor. It was flame-like in form, extending farther forward at some points than at others, and having a nebulous off-shoot which ran in the neighborhood of the macula, but in which I could not discover any vessels.

For a short time this growth (which was seen by Dr. William Thomson soon after it had made its appearance) seemed to increase somewhat in size, but after this I thought I discovered a diminution in it. The last time the patient was seen was on June 3d, shortly after which she sailed for Europe.[1] The growth was then perceptibly smaller, and the

[1] The patient returned from Europe the last of October, and I have had several opportunities of examining the eye since that time. When last seen (Dec. 1st), vision was 20-xx(?), and there were no evidences of recent hæmorrhages, but the vascular growth was undoubtedly larger, and it could be seen distinctly, by the direct examination, with a +4 D. glass. Tn. No pain.

patient was less conscious of its presence, the sight of the affected eye being, as she described it, more natural. Her vision was not tested at this visit, but when determined a short time before was, for the right eye, $\frac{20}{20}$(?).

The case is without a parallel in my experience; but I am inclined to regard the development of new vessels, which is its peculiar feature, as an effort of nature to clear away the débris of the repeated hæmorrhages, and to repair the damage which they had caused. Unless, therefore, other and more disastrous hæmorrhages should yet occur, a favorable result may, I think, be anticipated.

DISCUSSION.

Dr. Carmalt.—The second case reported is so very similar to a case that has been under my care and which has been seen by several members of this Society, that I bring it up here with the explanation that I have not reported it to the Society, because the gentleman who is the subject of the lesion will not allow me to complete the history. I wish him to let me have a drawing made of the appearances, but he will not consent.

February 17, 1877, he presented himself to me complaining of sudden blindness in the left eye. I found the vitreous so full of blood that I could detect no details, and I thought it might be a case of complete detachment of the retina. A month later, the blood was absorbed and I found nothing peculiar. There were simply traces of coagula in the vitreous. There were no extravasations in the retina itself. August 3d, of the same year, he felt something wrong with the other eye, and as I was out of town he went to New York and consulted Dr. Noyes, who found hæmorrhage into the vitreous of that eye, with "a patch of tissue change, probably in the choroidal vessels over the region of the macula." The hæmorrhage in that eye cleared up, and on June 3d, 1878, the vision of the left eye became again blurred, and I found floating opacities through the vitreous. I asked him to again consult Dr. Noyes, who wrote me that he found numerous floating opacities in the left eye, and that a mesh of floating vessels extended forward from the retina nearly to the lens and could be seen with + 4 D., and extended back to the fundus. He thought that he

could detect some communication with the retinal circulation. Some traces of new formed connective tissue were seen. The doctor further stated that he had seen this lesion but once before, and that was during the same week. The optic nerve was pale, the veins large and the arteries small.

These congeries of vessels could be traced, running from the retina forward to nearly behind the lens. They are distinctly defined loops twined among each other. I do not know if they start as a single branch and subdivide or not. Dr. Agnew and Dr. Loring also have seen it, and the condition persists to the present time. To make the comparison with Dr. Theobald's case complete, he also has every few months attacks of hæmorrhage into the vitreous and becomes blind for several days.

It happened that after getting the notice of Dr. Theobald's paper, I saw the man with a patch over his eye. He stated that he had had a hæmorrhage the day before. He has had one since then. These later hæmorrhages have been in the eye opposite the one containing the congeries of vessels. This one has also had one attack since.

Dr. Knapp has shown me the drawing of a case which he has seen, and I have seen Jaeger's plate of a similar condition, but the appearances in my case are much more distinct and striking than either of those.

DR. FRYER.—As bearing upon the case of recurrent hæmorrhages, I would ask if the attention of the members has been directed to scurvy as a cause. I saw one case of recurrent retinal hæmorrhage which I thought was due to this.

DR. WADSWORTH.—I have seen several cases of recurrent hæmorrhage, partly retinal, but largely into the vitreous. In only one instance can I say positively that the affection was accompanied by the development of vessels into the vitreous. I recall two other instances which were very similar in their earlier stages, but these I could not follow up sufficiently long to be sure whether vessels developed or not. The case in which vessels did develope is that of a man who was a lieutenant in the volunteer army during the last year of the war, and who was twenty-nine years of age when I first saw him, in February, 1877. When first seen, he had extensive hæmorrhages into the vitreous of one eye, and the fundus was not visible. After a time this cleared up in considerable part, so as to leave portions of the retina pretty distinctly visible. Then certain changes in some vessels toward the periphery could be seen and hæmorrhage into the retina was noted. The other eye showed a perfectly healthy fundus, except in some places toward the equator. There were here several

small patches of perivasculitis. The vessels ran along of normal size and course, but were in parts covered with whitish bands. In one place there was an enlargement, resembling, in size and relation to the vessel, the joint which plumbers make on lead pipe. This was of a white color and hid the vessel completely. In other respects this eye was normal. The affected eye cleared up largely, and the man returned to his home. The hæmorrhages continued to recur on slight or no provocation, making him almost blind in the one eye, and after a time would clèar up.

The result was, that in the clear periods the retina could be made out fairly well every where, but there were some nearly transparent membranes in the vitreous which contained vessels, some of which could be traced back to the retinal vessels. About three years ago, I saw the man last. He had then been free from recurrences of the hæmorrhage for a year or two. There were still some vessels in the vitreous, but not so many as previously.

The appearances seen in the other eye disappeared completely, and the sight of that eye was never affected. The man complained of nothing but the disturbance of sight, and said that his general health was perfectly good. He was examined with great care by the late Dr. Ellis, who was unable to find any diseased condition whatever.

Another case of recurrent hæmorrhage coming under my notice is that of a young man twenty-five years of age, strong and vigorous. He came to me shortly after the occurrence of sudden blindness in one eye, the result of hæmorrhage into the vitreous. He had been seen by Dr. Hay with hæmorrhage a year before. When he first came to me the fundus could not be made out. The hæmorrhage cleared up to a certain degree, and one could see thin membranes in the vitreous. At one time, one of the membranes hung down from above like a bag to a little below the horizontal meridian, and contained a clot at its lowest part.

After central vision had improved to nearly $\frac{14}{12}$, a second attack occurred, soon after going to bed one Sunday evening, while the room was still lighted. He had made no special exertion during the day, and had not been reading during the evening. He suddenly noticed a loss of sight, and on testing the eye found that vision was gone. I saw him the next day and found increased opacity in the vitreous, which again partly cleared up. Whether or not vessels developed, I cannot say. In this case also there were changes in some of the retinal vessels and hæmorrhages in the retina of the affected

eye, and some exudation and small hæmorrhages in one part of the equatorial region of the retina in the other eye.

DR. KNAPP.—If I remember correctly there is a picture of this condition in a recent European journal. I wish to say a word about the treatment of recurrent hæmorrhages. I have frequently seen it relapse. The development of blood-vessels in the vitreous is rare, but I have seen it. The main point in the treatment is to keep off all fatigue from the eyes, more especially to put the patient to bed early in the evening. A waitress in a wealthy New York family had hæmorrhages into the vitreous whenever the family gave an evening party, when she was obliged to be up late. I sent her to the country, and the hæmorrhages cleared up and did not recur. She returned to the city, there was an evening party, and again the vitreous filled with blood. She then gave up service, and for two or three months has not had a relapse. Not knowing anything that will prevent these hæmorrhages, I have treated them in the same way as congestions of the choroid, that is, not to let the patients work in the evening, make them go to bed at eight or nine o'clock, and avoid everything that is apt to produce a dropsical condition of the blood.

EMBOLISM OF THE CENTRAL RETINAL ARTERY.

By GEORGE C. HARLAN, M.D.,

PHILADELPHIA, PA.

IN an article published by Samelsohn in the 3d vol. of the Archives of Ophthalmology, the author observes that "a case of blindness occurring in connection with the chain of symptoms which characterize embolism of the central artery of the retina, is still entitled to be regarded with more interest than a single observation in most instances is capable to elicit." Though a number of cases have been reported since, it has seemed to me that the comparative rarity and the startling character of this accident, the variety in the ophthalmoscopic

appearances that have been noted in different cases, and the extent to which the subject has been discussed, make this observation true enough even yet to justify me in bringing this case before you. If further excuse be needed, it may perhaps be found in the very obscure pathology, upon which I would be glad to have the opinion of members of the Society.

The patient, C. J. S., was a clerk, fifty-two years of age, though much younger in appearance, and in excellent general health, with the exception of occasional slight recurrences of a malarial affection contracted in the army during the war. He applied to me in the morning of May 12th, stating that he came home from his work the afternoon before, feeling perfectly well, and took up a book to read. After reading for awhile in entire comfort he suddenly noticed a shadow before his left eye, and, on closing the other, found that he could just distinguish large objects about the room "through a brownish haze." In a few minutes sight was entirely gone. There had been no sense of discomfort in the eye either before or since.

The external appearance of the eye was natural and the tension normal. There was very dim, almost doubtful, perception of light. The retina was obscured by œdema, which was nearly uniform, though rather less dense towards the periphery, and gave the whole fundus a grayish tinge. The disc was pale and its margins blurred. The arteries were very pale, though not much narrowed, and some of the smaller branches seemed lost in the retinal œdema. The larger veins were contracted in places, but generally of full calibre. The superior temporal vein was contracted to a thread on the disc and a little beyond it, but was slightly distended toward the periphery, and the blood could be distinctly seen moving through it, in bead-like sections, slowly and continuously towards the disc. The same kind of movement, in the opposite direction, could be distinguished with some difficulty in the corresponding artery. There was no arterial pulse produced by moderate pressure on the ball. Several of the minute terminal vessels near the macula were enlarged and apparently isolated, and at the macula there was a bright red

patch, oval in form, with its long diameter horizontal, in which the fovea was not distinguishable. At the outer margin of the disc were two small dots of retinal hæmorrhage. The right eye was normal, and V. = $\frac{20}{20}$ with a weak cylinder.

5.13.—The retina was much more œdematous, the margins of the disc scarcely distinguishable. The arteries were paler and slightly narrowed, and the smaller branches lost. The movement in the blood column had entirely disappeared in the temporal artery; in the vein it could at first be distinguished, on careful inspection, at the periphery, but disappeared during the examination. The spot at the macula was dark red.

5.16.—Œdema still further increased, arteries more indistinct, but not much narrowed—none that could be called "thread-like." Some of the smaller veins interrupted in places. Narrowed part of superior temporal refilled to full calibre.

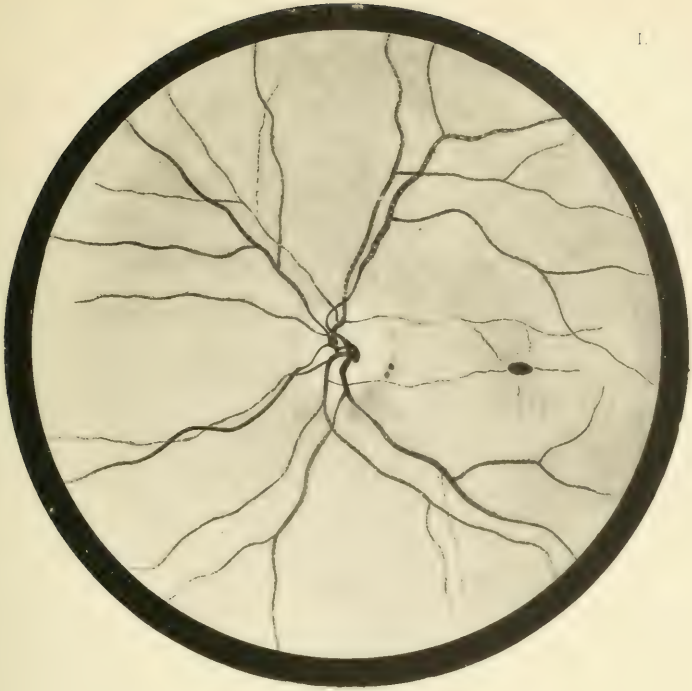
5.20.—Not much further change in arteries; veins of full calibre. Red spot at macula smaller. Œdema beginning to subside.

6.1.—Spot at macula much paler and of granular appearance, and containing a few sparkling points. Retina still hazy. Veins a little narrower and lighter in color. Only main branches of artery visible; not much contracted, but nearly empty and transparent.

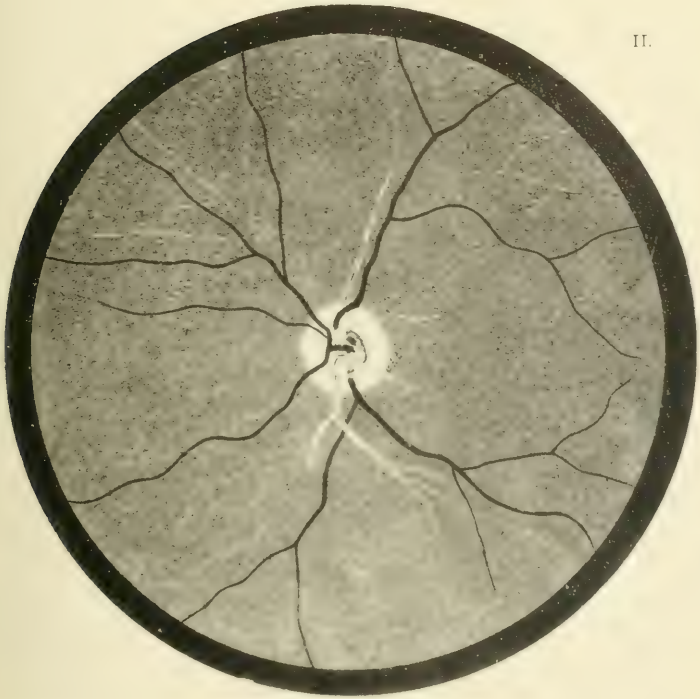
6.22.—Color of fundus nearly or quite normal. No œdema. Disc dead white. Spot at macula nearly faded away. Dots of hæmorrhage at margin of disc absorbed. Several small specks of cholesterine in their places. Veins rather narrow, uniform calibre, light color; only two of the large arteries visible, and they could not be followed further than 2 d.d. from papilla without the most careful focussing. They were pale and narrow, and a delicate white line could be traced along their margins.

6.28.—White lines more strongly marked, particularly on lower artery, which appeared as a fine red streak with distinct white line on either side. Some of the smaller branches, before invisible, could now be traced by a just perceptible white thread-like line.

I.



II.



This final condition of the arteries well emphasizes the fact, which is sometimes lost sight of, that empty retinal arteries are simply invisible from their transparency, and that any appearance of opacity they may present must be the result of changes in their walls or sheaths. Most of the arteries seem to have been gradually emptied of blood by more and more complete obstruction of the central trunk and contraction of their own walls, while some have been kept partly filled by ciliary anastomosis. The white streaks must be considered the result of perivasculitis, or of degenerative changes in the vessel walls. The symptom of visible circulation, without rhythm and with broken column, which in this case lasted little more than a day, is comparatively rare, but has been noted in a few recorded cases. The only other example of it that I have seen was in a case reported to the Society by Dr. Schell, in 1884. It can only mean an incomplete obstruction of the circulation, afterwards completed by a closer jamming of the embolus or an addition to its mass by the formation of clots about it.

The retinal œdema increased for about a week, and then gradually subsided as the collateral circulation was established. The fundus was still slightly hazy on the 19th day, after which the patient was not seen for several weeks, when its color was nearly, if not quite, normal.

The red patch at the macula, I think, was an ecchymosis. It bore no resemblance to the round "cherry-red spot" at the fovea described in some classical cases as the result of choroidal color not obscured by œdema at this point, and there were decided remains of it after the œdema had disappeared.

The symptoms and course of this case scarcely admit of any other theory than that of obstruction of the central retinal artery, and correspond very closely to those described in some recorded cases of embolus. In a very large proportion of these cases, however, a ready explanation of the origin of the embolus has been found, in valvular disease of the heart or atheromatous degeneration of the vessels, which is entirely wanting here.

Several well known experts pronounced the heart quite normal, the arteries at the wrist were soft and elastic, examination of the urine showed no evidence of disease, and there was no indication of irregularity in the cerebral circulation. A nasal catarrh of long standing had resulted in quite an extensive caries of the middle turbinated bone, on the same side as the affected eye, which naturally suggested itself as a possible factor in the causation of the accident. There was, however, no symptom to indicate that the orbit was involved, and, even if it had been, such an effect upon the artery would hardly have been probable; and this focus of disintegrating disease so near the eye afforded no more assistance in solving the problem than if it had occurred in any other part of the body. It is, of course, just possible that some product of this local disease might have entered the general circulation and been carried by the arterial current to a lodgement in the retinal artery. The only other possibilities that occur to me are that the obstruction might have resulted from thrombosis of the artery itself; or that an embolus might have been formed by a fragment washed from a parietal thrombus in some more or less distant artery. The first supposition is almost negatived by the suddenness of the attack and the healthy appearance of the retinal arteries when first examined; the second is no more than a guess.

A DANGER TO THE EYES OF IRON-WORKERS FROM THE USE OF OLD HAMMERS.

By GEORGE C. HARLAN, M.D.,
PHILADELPHIA, PA.

It is probably the general experience of ophthalmic surgeons, as it certainly has been mine, that in a large proportion of cases in which the eye is injured by chips of metal struck off in hammering iron, the offending particle comes from the hammer, and not from the iron struck. A case that was

recently under my care seems to show that many of these accidents may be easily preventable, as they result from working with a hammer that has been too long in use. A very intelligent mechanic came to the hospital with an eye destroyed by a piece of iron that had passed through the sclerotic and lodged in the vitreous chamber. He stated, as usual, that the chip had come from the hammer, and, after his discharge, brought the hammer to show me. There was quite a large nick in the edge, the result of two chippings at different times. On examining the section, I was struck with the singular appearance it presented; as if a layer of steel, about a sixteenth of an inch thick, had been welded on to the end of the hammer.

The man said at once, "It's crystallized by too long use; we understand all about that, and know we've no business to use these old hammers; if I had not done it I would not have lost my eye."

The patient had made this hammer himself, about eighteen months before, and it had been in use ever since. Of course, the cause of the change is plain enough, and it is easy to understand that a mass of iron subjected for a long time to rapid and violent concussion may become as brittle as glass.

A CASE OF RETINITIS PIGMENTOSA TREATED ELECTRICALLY.

By MYLES STANDISH, M.D.,

BOSTON.

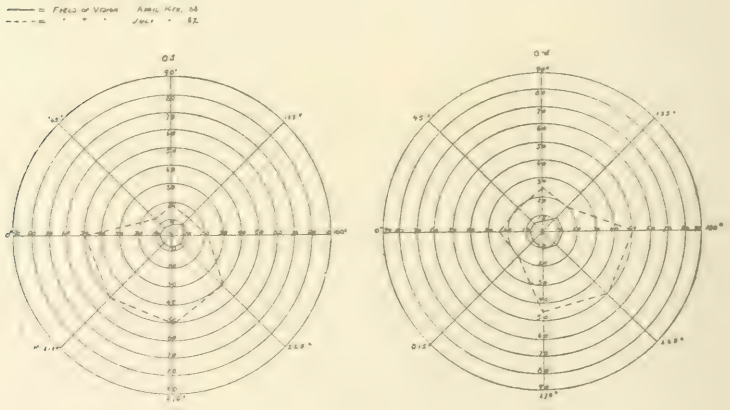
I am well aware that to report the result of the treatment of a single case of any disease and to draw deductions therefrom as to the efficacy of the method of treatment is a rash proceeding, and I would not occupy the time of the Society by reporting this case except for the fact that it is one of several cases reported at the last meeting of this Society by

Dr. Hasket Derby, in a paper which excited considerable discussion at that time.

The patient was a woman thirty-three years of age. She had myopia of 1.50 diopters in each eye, and had worn correcting lenses since she was seventeen years old. Her parents were not relatives. She was the only child of her father's first marriage, and had several half brothers and sisters who have never had any trouble with their eyes. Several members of herm other's family were "near-sighted."

When first seen by me on the 14th of April, 1886, she had noticed an increasing failure of vision for the previous three years, which had increased very rapidly in the three months previous to her visit to me. Her night-blindness had recently become so great that she could no longer go on the street after night-fall with safety. The ophthalmoscope showed a considerable number of the characteristic star-shaped spots of retinitis pigmentosa in the periphery of the fundus in each eye. Her vision was, right $\frac{12}{40}$; left $\frac{12}{50}$.

The field of vision did not extend over 20° in any meridian in either eye, as will be seen in the accompanying diagram.



The only treatment employed in this case was the continuous electrical current. The positive pole was placed upon the closed eye-lid and the negative pole on the brow or temple. The strength of the current used was only such as could be

comfortably borne, and has generally been derived from not more than four or six cells of a Stöhrer's battery.

The current has been passed in this manner for five minutes at a time, at intervals of several days.

For the last ten months there has been a uniform interval of five days between the sittings. The patient has not been restricted in the use of her eyes while under treatment, and has used them constantly for fine work.

For the fifteen months that she has been under treatment there has been a steady improvement both in central and eccentric vision from the commencement up to the present time, except as hereinafter stated. These exceptions are, first, that there has been no improvement of vision for the last three months, although under treatment during that period; and, second, that in the summer of 1886, after the patient had been under treatment for four months, she went out of the city on a vacation, and was absent for six weeks, during which period the electricity was omitted, and upon her return it was found that her vision had fallen somewhat, both centrally and eccentrically, but the loss did not exceed a quarter of what she had previously gained. Her present vision is, right $\frac{12}{30}$; left $\frac{12}{15}$. The present horizontal diameters of the fields of vision, as will be seen by the diagrams, are, right 75°; left 70°; and the vertical diameters are, right 70°; left 68°.

This rather startling result has been verified by repeated examinations. The fields of vision have been taken with great care in the earlier, as well as the later periods of observation; upon a perimeter, at noon, on a clear day, with the perimeter facing the light, and at the same distance from the window at each trial. The objects used in determining the areas of the fields have been pieces of white paper, one centimetre square. On testing central vision the test types have been changed from time to time to avoid the danger of making too high a record by the use of familiar letters.

Some ophthalmoscopic changes have taken place while the patient has been under treatment; but these changes have been confined to a widening out of the prolongations of each

patch of pigment, so that they do not now present such characteristic bone-corpuscle-like shapes as they did when first seen. No new patches of pigment have appeared.

To argue from this case that all or even a very considerable number of cases of retinitis pigmentosa would be similarly benefited by the use of electricity would be manifestly absurd; but that such an improvement in central and eccentric vision should happen to any case of retinitis pigmentosa, either with or without treatment, is a noteworthy fact, and one that should draw our attention to the circumstances of that particular case.

We have present in this case, besides the constant treatment during a period of fifteen months, several other peculiarities. It came on fully as late in life as this disease ever develops, that is, if we may believe the patient's statements, at about thirty years of age, but did not progress very rapidly until the last three months before she came under observation, during which period, however, the onset of the disease was unusually rapid. Again, when first seen, the impairment of vision was very much greater than we should be led to expect by an examination of the fundus, from which it would appear that treatment was begun while the disease was yet in its active stage, preceding the visible deposition of pigment in the retina.

From these considerations it would seem, in so far as one case is capable of teaching anything, that when a case of retinitis pigmentosa is seen in its earliest stages, or when there is a sudden exacerbation of the disease, as evidenced by diminution of the functions of the eyes, a trial of galvanism should be made.

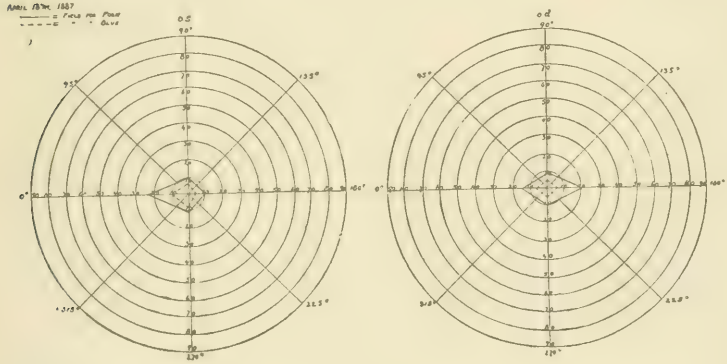
DISCUSSION.

DR. DERBY.—In this connection I wish to present a case of retinitis pigmentosa, treated by electricity, in the service of Dr. Sprague, at the Massachusetts Charitable Eye and Ear Infirmary, for the report of which I am indebted to Dr. F. E. Cheney, of Boston.

John E., aged thirty-two, born in England, a laborer by occupation; parents first cousins. No other member of his family is known to have any trouble with vision. Patient had always considered himself near-sighted, but at about the age of fifteen began to notice a failure of sight, especially marked after sundown. From that time until the present the decrease of vision has been continuous, with a marked increase in rapidity during the past five years.

At time of entrance into the Infirmary the pupils were moderately dilated, and reacted poorly to light. Small central opacity on posterior capsule of both lenses. Vitreous clear. Fundus presented the usual appearances of an advanced form of retinitis pigmentosa.

April 13, 1887.—Began use of constant current, four cells of a McIntosh battery. Positive pole on closed lids, and negative pole on opposite temple. Electricity applied five minutes to each eye every day for five days, and after that five minutes every other day. At the end of application considerable pain was complained of; it continued for about one hour at first, but became less and less marked as treatment continued. The pain was entirely confined to the globe, and was described as of a darting, burning character.

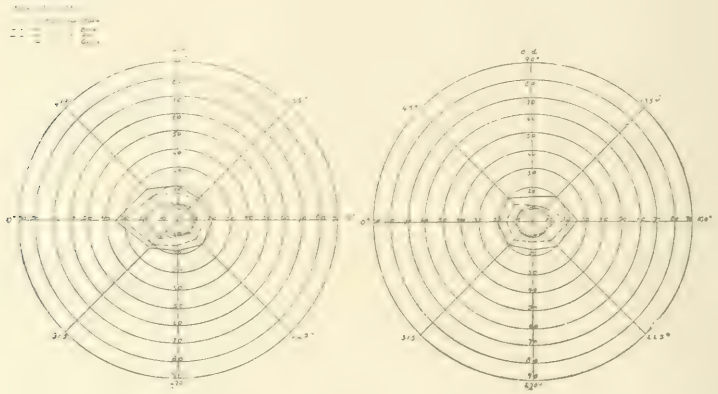


April 17th.—The field of vision, taken this day, is given in diagram No. 1.

Right eye, My. 6. D., V. = 0.1.
Left eye, My. 5.50 D., V. = 0.2.

As will be seen from the diagram, there was, at this time, no field for red and green. May 15th.—Vision of right eye

was nearly two tenths, each field had increased in extent, and there was an area over which red and green were appreciated. Patient was tried with colored worsteds, and found able to select various shades of red and green with but slight hesitation.



July 5th.—Each field increased, as shown in diagram No. 2.
Right eye, V. = nearly 0.3.
Left eye, V. = 0.3.
Patient discharged from Infirmary.

COLOBOMA OF THE OPTIC NERVE AND SHEATH.

BY B. ALEX. RANDALL, M.D.,
PHILADELPHIA, PA.

IN the American Journal of Ophthalmology of Nov., 1886, the writer began a projected series of contributions of anomalous conditions of the eye-ground by the publication of a case of that appearance, probably congenital, for which he urged the name of *underlying conus*. The relation of this anomaly to the various forms of arrest of development known as *colobomata* had been already too well urged by Fuchs and Szili to

need further discussion; and his case was given merely as an amplification of what they had demonstrated, and as a protest against their names for the appearance, since the "conus downward" may occur *above* the disc. That the condition, although akin to coloboma of the nerve or sheath, is not necessarily an incomplete form of these anomalies nor a substitute for them, seems probable from the following case, observed at the Eye Clinic of the University of Pennsylvania, and published by permission of Prof. Norris and Dr. Risley.

Kitty McD., aged fourteen, came with a schoolmate to the Clinic to see if the glasses, with which they had been supplied by an optician, were suitable for their use in the Convent-school. She complained of near sight and defective vision, and was wearing — 3 D. sph. for each eye. The subjective tests showed on the right V. = $\frac{20}{200}$ and with her — 3. V. = $\frac{20}{75}$ + ?. Jaeger No. 1 could not be read, and Jaeger 3 only from 5″ — 7″. The left eye had V. = $\frac{20}{100}$, and with — 3. V. = $\frac{20}{75}$?, and the accommodation seemed the same as on the right. The astigmatic lines were selected vertical with each eye, and there was slight insufficiency of convergence.

The first glance with the ophthalmoscope into the right eye revealed the anomaly depicted in Fig. 1. The site of the optic disc was occupied by a whitish circular area, more than double the breadth of the disc to be seen in the left eye. The general eye-ground was best seen with — 3. or — 4. D.; and the irregular crescentic segment of the circle above was at the same level, and was evidently the distorted optic papilla. The upper temporal artery and the upper vein passed through its substance; while other arteries and veins arose or ended, as represented, beneath its rounded lower margin. This margin was abrupt, and descended to the general level of the excavated area—visible only with —9. D. A still deeper depression, of rounded outline, occupied the lower nasal portion of the area; its margin coinciding in part with the edge of the excavation. Its lower edge was overhanging, concealing the deeper portions of the vessels which climbed over its margin, while the upper was steeply shelving, as indicated by the course of the artery which traversed its upper border.

Fig. 3. Coloboma of Nerve
Fig. 1.
Coloboma of the Optic Nerve
and its Sheath.
Fig. 2 Coloboma of the Nerve
Randall del

The deepest part of this cup required — 13. D. to bring it into clear view. A ring of dark pigment surrounded the whole circular area; and outside of this was a yellowish crescent of pigment disturbance, embracing the lower three-quarters of the circumference, and for the most part outlined by a second pigment band. Directly to the temporal side this crescent was least defined—presenting the appearance of a "commencing conus,"—while within its pigmented edge at this point was visible the narrow, whitish, deep-lying band, generally known as a "broadened scleral ring." The floor of the general excavated area was of the greenish opalescent appearance usually seen in colobomata; but its lower portion, not occupied by the deeper excavation, showed a whiter, more tendonous reflex, exactly as in the *underlying conus*. Only the exquisite skill of von Jaeger's brush could give an adequate picture of this appearance; and the present sketch is but a diagramatic representation of its location: yet its difference from the rest of the excavated area was patent to every one who examined the eye. Here, then, *in conjunction with* a typical coloboma of the optic nerve and its sheath, was a condition which those accustomed to study carefully the various forms of underlying conus did not hesitate to agree in classing under that title.

In the left eye the papilla appeared small, nearly vertically oval, with a deep central excavation, and its margin outlined by a black pigment band. No *structural* anomaly was discoverable; but the choroid and retina were in bad condition, and the refraction seemed a simple myopic astigmatism corrected by — 3. D. ax. 165°. Under prolonged use of atropine — 3. D. sph. gave her V. = $\frac{2}{5}\frac{5}{0}$ on the right; and on the left, + 1. cyl. ax. 75° ⌒ — 2. cyl. ax. 165° gave V. = $\frac{2}{6}\frac{5}{4}$.

It seems not out of place to append to the foregoing case a sketch and note of another, dissimilar in many respects, yet presenting an anomaly probably related to it:—

Thomas A., weaver, aged thirty-one, presented himself at the Episcopal Hospital Clinic on April 4th, 1886, complaining of pain and dimness of his eyes at his work. The vision was $\frac{2}{5}\frac{0}{0}$ on the right and $\frac{2}{2}\frac{0}{0}$ on the left, and the accommodation

was subnormal, with insufficiency of the convergence. Externally the eyes seemed normal but for some injection; and the ophthalmoscope showed nothing important on the right— the disc vertically oval, with a slight excavation shelving to the outer margin, beyond which was a vague crescent of pigment absorption.

On the left the nerve was horizontally oval, with a deep *porus* also horizontally elongated, its edges steep and below overhanging. The central artery emerged from this, and most of the veins entered it; but in the irregular manner depicted in Fig. 2. Near the lower nasal border of the disc was a second *porus*, over the rounded and prominent lower lip of which the lower nasal vessels climbed, their deeper portions hidden by its overhang. A portion of the disc of the same level as the general eye-ground separated the shelving upper portion of the depression from the central excavation. Down and in the disc margin was clearly cut and bordered by choroid as normal as at any other portion of the circumference; although directly in, as also at the outer margin, there was a crescent of disturbed pigmentation. The retina was slightly hazy and was markedly striated, especially above and below the papilla. Just beyond the lower nasal border was a remarkable line of black pigment, irregular but sharp cut, lying anterior to the retinal vessels. There was some disturbance of the choroidal pigmentation towards the periphery of the eye-ground; but no further traces of retinal pigmentation or other anomalies.

There was low hypermetropic astigmatism of each eye, probably demanding correcting glasses for his exacting work; but as he was below par in general health and his asthenopia was probably largely muscular, iron, quinia and strychnia were prescribed, as a preliminary. He did not return as directed, and has been lost sight of.

To style this marginal excavation a coloboma of the optic nerve would probably be going rather far, although it differs from the typical form of that anomaly rather in degree than in kind, and is certainly sufficiently akin to be cited in that connection. No exactly similar condition has to my knowledge been recorded, nor has it come under the notice of several experienced observers.

On February 21st, 1887, my attention was kindly called by Dr. Risley to an anomalous condition of the optic disc observed by him in the case of a young lady of fifteen years of age; and by his courtesy I have the opportunity of drawing and publishing it.

The ophthalmoscope showed in the right eye a greyish coloration at the outer portion of the disc, which closer study showed to be due to a depression—sharp cut and overhanging outward, but shelving in other directions. The disc was vertically oval, outlined to the nasal side by a greyish pigment band, and to the outer by a broadened scleral ring with a narrow absorbing crescent beyond. There was a conical central *porus*, where most of the vessels arose or ended, the shelving outer portion of which passed into the outer depression before it had quite attained to the general level of the disc. Two fine vessels from the centre of the *porus* passed, as indicated in Fig. 3, into the anomalous depression; three others, apparently venous, entered it from the retina of the macular region; and three branches were sent into it from the upper temporal artery, and one from the lower temporal vein. No communication of these vessels could be discovered within the depression—where indeed all detail was inexplicably vague. Careful focussing followed the vessels to the depth of some 3. D. (the central excavation being but 2. D. in depth), but instead of showing the brightly reflecting sieve of the *lamina cribrosa* as did the the *porus*, the anomalous depression gave a vague *bottomless* effect. The first impression as to the condition was that a vitreous opacity was casting a shadow on the outer part of the disc: but there were no opacities in the media nor other abnormalities in either eye. The refraction was low hypermetropic astigmatism and the vision normal.

Shortly after sketching this case, the very similar one reported by Szili in the "Centralblatt für pr. Augenheilkunde" of January, 1887, came to notice, in which the utter vagueness of all detail in the abnormal excavation was even more marked than in this—no small vessels being present to serve as objects for focussing. No other case has to my knowledge been reported.

One further observation may be noted in closing. In a case of binocular choroidal coloboma, where the defect of the choroid was separated from the disc by a band of normal tissue twice as wide as the disc, the lower nasal quadrant of the disc showed a peculiar grey-green coloration. There was no evidence of a depression of the surface; the patient was a girl of 20, with vision and a field normal except for the choroidal defect; and the only explanation which I could see for the appearance was that a cleft existed at this point in the deeper portions of the nerve and its sheath, which had however closed in at the surface of the disc. No similar condition was present on the other side, where the coloboma was larger and the choroid between it and the disc was thin and imperfect.

DESCRIPTION OF A CASE OF COLOBOMA OF THE IRIS, LENS AND CHOROID: WITH A STUDY OF THE VISUAL FIELDS.

By CHARLES A. OLIVER, M.D.,
PHILADELPHIA, PA.

J. K., an unmarried woman of twenty years of age, a native of Switzerland, was admitted into the medical wards of St. Mary's Hospital, for an attack of typhoid fever. During her stay, the following ocular conditions were noticed. In each eye there was a coloboma of the iris situated in the lower inner quadrant, giving the pupil the form of a keyhole; the edges of the cleft being slightly divergent. With the exception of a few fine connecting fibres, the coloboma extended quite up to the ciliary margin. Oblique light showed that there were small, almost imperceptible blebs throughout the conjunctiva of the globes and lids. In both lenses there were small indentations at the inferior peripheries; the coloboma in the left lens being slightly to the outer side, though much

less in extent. The right lens was freely mobile, vibrating with every movement of the eye; the freest portion being directly opposite the coloboma of the iris. The examination was rendered extremely difficult by a constant horizontal nystagmus, which increased in rapidity and amplitude of excursion when the patient was made to fix upon any object.

Ophthalmoscopic Examination.—This was done without the use of a mydriatic. In the right eye there was a coloboma of the choroid occupying the lower part of the globe, which deviated slightly to the temporal side, and extended as far peripherally as the instrument could be made to explore; the upper border being separated from the non-colobomatous portion of the eye-ground by an irregular broad black line of pigmentation. The optic nerve was almost entirely included in the coloboma. The disc itself was irregularly round, about seven diameters in apparent magnitude, and bordered by a pigment ring beyond a scleral ring, which was slightly broader to the nasal side. The nerve appeared of a peculiar greenish gray tint (gas light), with very little capillarity in its substance. The retina looked like a thin filmy haze, evenly stretched over the entire surface, more noticeable in the colobomatous portion, except at one depressed place in the sclera down and out, where it seemed to skirt across from edge to edge. A very fine retinal striation could be seen in the region of the disc. Both retinal arteries and veins were small, though, curiously, their distribution seemed almost of a normal character, except as they left the disc on its lower border, where they were more closely grouped, and failed to make their primary bifurcations as early as the upper branches; there probably being a slight inclination of the upper temporal branches to follow the border of the defect: there was also a possible difference in favor of the amount of blood distributed throughout the undisturbed portion of the eye-ground. The sclera corresponding to the defect in the choroid was, with one exception, free from the compartments and protrusions so generally found in this class of cases; a shallow, oval depression of two disc diameters in its long axis, in the lower outer quadrant of the coloboma, being the only visible ectatic part.

Very few choroidal vessels were seen, and these mostly noticed in the periphery of the coloboma. The difference in level between the two portions of the eye-ground, with the exception of the small depression above noted, was very trifling; the fundus in the macular region being most plainly visible with a concave lens of six dioptrics focus. The entire surface of the coloboma gave the effect of a rather glittering, whitish, concave piece of enamel, containing in places a fine and irregularly radiating net work; the whole being covered by a delicate grayish veil which carried a series of interlacing larger bright and dark red lines.

The accompanying phototype represents the shape of the coloboma and the disposition of the retinal vessels fairly well.

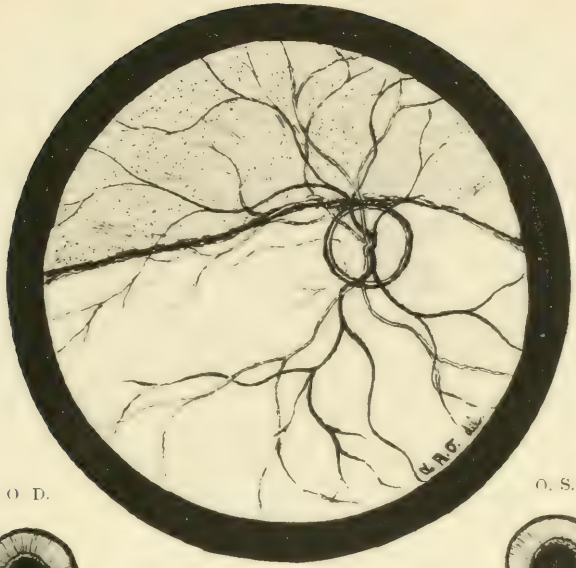
The ophthalmoscopic picture in the left eye was almost identical, except that the coloboma was less extensive and more irregular in outline, and the retinal vessels were somewhat more "dragged" (vide plate showing colobomatous area). Refraction the same as in the other eye.

Central Vision for Form.—With the right eye, direct vision for form was reduced to light perception, although the patient could, by rolling the eye and head up and out, just manage to obtain glimpses of the fifty-dioptry type at one-half metre distance, this not being improved by glasses. A vision of $\frac{1}{50}$ could be obtained by the use of a correcting lens, when the patient looked directly at the test-type with the left eye.

Central Color Perception.—Careful examination by loose wools (green, rose, red, blue, and yellow), made with each eye separately, failed to reveal any subnormal color-perception; the patient twisting her head to the outside whilst using the right eye.

Fields of Vision.—These were quite interesting, and were obtained in the ordinary way of having the patient stand about thirty centimetres in front of a large, ruled blackboard. One eye was used at a time. One centimetre square of unglazed colored papers pasted on slips of dead-black cardboard were carried in various directions inward from the periphery of the board towards a central cross, upon which the eye was obliged to steadily fix. In the present case it was found

O. D.



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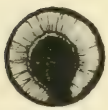

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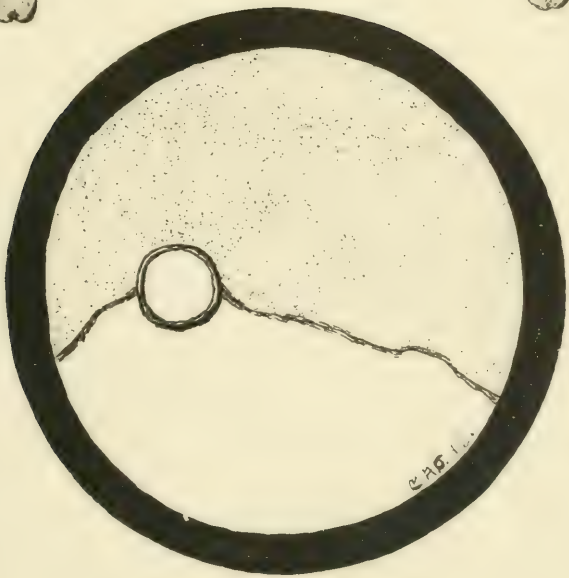

HELIOTYPE ROHTERMUNDT PHILA.

necessary with the right eye, by reason of such great loss of its central vision, to substitute a candle flame for the white cross; this being seen as a faint yellow glare. The second candle, carried throughout the entire visual field, showed that it was brightest at a point in the nasal field about six inches distant on a horizontal meridian from the fixing candle light; the light gradually fading in all directions, though much sooner to the upper outer side. Around this point there was an almond-like area of about five inches in its longest diameter —the horizontal—and three inches in the vertical; in this area colors could be recognized. The lower border of the area was bounded by a large space of ever-decreasing good light perception, whilst the space above the upper border gave but indifferent light projection, which was soon lost. In this color field, white gave the largest area, followed by yellow and blue, both of which were first designated as "white." Red, which came next, was first called "yellow." Green, which was the smallest, first appeared as a "shadow," then "white," before being correctly named. The same average shape in each individual field was observed throughout all. In the left eye, central fixation by the means of the white cross was possible. The division between the colobomatous and the healthy portion of the eye-ground was accurately marked; the colobomatous part of the ground projecting nothing but a fast decreasing light perception. Here, as in the other eye, the form and color fields were contracted—more so in the vertical meridian, giving the field an elongated lozenge-like shape. They followed the same order as in the other eye, and were primarily misrepresented in the same way.

No other congenital malformation was noticed, and the patient's family history for three generations back was entirely free from any deformity.

PHOTOGRAPHY OF THE INTERIOR OF THE EYE.

BY LUCIEN HOWE, M.D.,
BUFFALO, N. Y.

THE applications of photography are already so numerous in various departments of surgery, that it is not strange some attempt should have been made long ago to picture in this way the interior of the eye. One might at first suppose the problem presented to be comparatively simple. We know that the eye itself is a camera, and when placed behind an ophthalmoscope it has pictured upon the retina an image of an eye observed. Apparently it would only be necessary to substitute for the observing eye, in this position, another camera such as a photographer uses. That the problem is a difficult one, we may readily infer from the imperfect results thus far obtained. To appreciate how little has been done, it is worth while to refer very briefly to the literature of the subject. One of the earliest references to the subject is by Dr. Rosebrugh in the American Jour. of Ophth., N.Y., 1864. He describes there an arrangement by means of which he made photographs of the fundus oculi of a cat under chloroform; but gives no results. Later, he says, "My attempts at photographing the human retina were not attended with success." Since that, the only article deserving attention appeared in the Photographic News, London, May, 1886. In this the results were given of the attempts made to produce a photograph of the optic nerve. The writers on this were able to picture the optic nerve as an irregular white blotch, but nothing more; no arteries nor veins being visible. Even this was better than any representation of the human eye previously made. It should be understood that there is no great difficulty experienced in photographing the interior of an artificial eye, like that of Perrin. The value of the appa-

ratus used was usually tested with this, and some excellent results obtained. The principal difficulties arose when dealing with the living eye. The photograph to which I venture to call attention is here presented. It will be seen that the disc is perfectly distinct, even the shading of the different parts well defined. Moreover, the vessels are so clearly shown over at least a third of the fundus that the arteries can be distinguished from the veins. A decided defect is a triangular white spot, due to the corneal reflection, seen near the edge of the picture. I wish to emphasize the fact, however, that the accompanying photographs represent the real results as they are, without attempts at retouching, modifying, or improvement of the negative in any way.

It is but fair to say that for these results I am indebted principally to my assistant, Dr. Elmer Starr, of Buffalo, N. Y., and that, imperfect though they may seem, they were obtained only after much difficulty and many variations in the details of the experiments. It may be worth while in addition to make brief reference to the difficulties encountered, and the manner in which they were obviated. First, as to the difficulty in photographing the red reflection; of late years a number of practical workers have been trying to produce plates which were sensitive to the red ray, and advances have been made gradually in this direction by Waterhouse, Ives and others, till a considerable degree of perfection is now attained.

It is unnecessary here to enter into any details concerning these processes; and to any one interested, I would refer to the Philadelphia Photographer of May the 7th of this year, where an excellent article can be found, on what is known as isochromatic photography. The plan followed in making these pictures consisted principally in treating them with the following solution:—

Erythrosine	1.5 drachms.
Ammonia (88 degrees) . . .	1 drachm.
Alcohol	6 ounces.
Nitrate of Silver	1 drachm.

Converted into chloride with hypochloric acid, thoroughly washed, and re-dissolved in ammonia; bulk made up to two ounces.

That these are sensitive to the red light is shown, at once, by the difficulty one experiences in developing them, when exposed to the ordinary light in the photographer's dark room.

Having thus obtained a plate which is sensitive, the next step was to arrange an optical appliance by which the image of the observed eye could be produced upon the plate of a camera placed in front of it. One would suppose that the ordinary demonstrating ophthalmoscope, such as has been suggested by Carter, would be sufficient for this purpose. In reality, however, it was found by no means adapted to it, principally for the reason that, on account of the weakness of the convex lens which he uses, there was not enough of the fundus of the eye shown nor a sufficient amount of light reflected from it. In order to obviate this difficulty, experiments were made with artificial light and daylight, by varying the strength of this lens and the size of the hole in the concave mirror, and trying lenses of different size also for the camera, at last arriving at the conclusion that it was best to employ :—

First.—An ordinary Argand gas burner placed in the focus of a concave mirror of about thirteen inches focus.

Second.—That the mirror have an aperture of about one half an inch.

Third.—That the light reflected from the mirror should pass through a plano-convex lens, whose focal distance was two inches.

Fourth.—That an alum cell be interposed somewhere in the line of the ray, in order to shut off as much as possible the heat which otherwise would be focussed with the light upon the eye.

It is worthy of remark, parenthetically, that such an arrangement is, to my mind, a decided improvement upon the form of ophthalmoscope ordinarily used for class demonstration, as it gives a view of a considerable part of the fundus, together with more light than is ordinarily obtained, and with less inconvenience to the patient. The third difficulty met with was that of keeping the eye quiet, when exposed to the

glare and heat of the lamp. This was obviated by the alum cell and by the use of cocaine. These and other details of manipulation may be described at another time. The simple outline of procedure seemed to be worthy of record, however. For while it must be admitted that the results here presented are not entirely satisfactory, on the other hand this is, as far as I can learn, the first time that any photographs of the interior of the human eye have been produced in which the details were even recognizable, and as such, they at least give promise of results of great practical value in the future.

I also take the opportunity to show two photographs of the interior of Perrin's artificial eye, taken by Dr. Charles A. Oliver.

DISCUSSION.

Dr. Oliver.—The two pictures exhibited by Dr. Howe are of the fundus of the artificial eye of Perrin, and were taken by Dr. Wharton Sinkler and myself, in July of 1886. They are presented to the Society to show the result of the progress of a modified method which is now being applied by the authors to the human eye. Letter A Carbutt's dry plate is used with ten minutes' exposure to an ordinary gas-light, giving an untouched and unremagnified negative with a clearly cut disc of about twenty-five millimetres in its long diameter (about × 16), surrounded by an area of one hundred millimetres diameter, upon which the retinal vessels and gross changes in the retina and choroid can be plainly seen for nearly seventy-five millimetres area round the disc; the whole being entirely devoid of any disturbing light reflexes. Phototypes of these photographs have been made, and will be combined in a future publication upon the subject, which is now being prepared by the authors.

A CASE OF CONGENITAL, ZONULAR, GRAYISH-WHITE OPACITY AROUND THE FOVEA.

By O. F. WADSWORTH, M.D.,
BOSTON.

The case is similar to those that have been reported by Magnus, Goldzieher and Knapp. Magnus's case appeared in the Monatsblätter für Augenheilkunde, January, 1885; Goldzieher's (the orginal report of which I have not been able to consult) in the Wiener Med. Wochenschrift, No. 11, 1885; Knapp spoke, at the Heidelberg Congress, in 1885, of two cases he had seen.

Ida Fleischer, eleven months old, the child of German Jews, was seen at the Massachusetts General Hospital, February 8, 1887. She had a good color and appeared very well nourished, but was unable to sit or stand or hold her head up, or even to hold anything in her hands. Her flesh was excessively soft, and the muscles of the back so thin that the transverse processes of the vertebræ could be easily felt. The head was apparently well formed, the face sufficiently intelligent, but she took very little notice of anything. She was said never to cry. Bowels very constipated. Heart sounds normal. Knee jerk present.

The eyes were externally normal; mobility apparently good; pupils rather large, but fairly active. Vision was evidently very imperfect, and during ophthalmoscopic examination she fixed pretty steadily the mirror, so that it was difficult to obtain a satisfactory view of the discs. From the fleeting view obtained the discs did not seem to vary from the usual appearance at her age; that is, they were rather

grayish, but with apparently normal vessels. The steady fixation, however, made it very easy to study the macula. Here there was a dark red oval at the centre, surrounded by a whitish, evenly-tinted zone, on which fine retinal vessels could be distinctly traced. The picture recalled vividly that seen with embolism of the central artery, but with this difference—the zone was of uniform width, and although it shaded off somewhat toward the periphery, its outer edge was yet pretty sharply defined, but not so sharply as its inner edge. The diameter of the zone was about one and a half times that of the disc. The macula-reflex, which Magnus described as encircling the zone, I could not see, as Knapp could not in his cases. The remainder of the fundus appeared normal. The picture was alike in both eyes.

The child was seen again after a short interval, and once more on June 30th. Meanwhile, her appetite had been fair, but she had lost much flesh, although still looking in fair condition. There was the same weakness. She took no notice of objects or movements about her. She had slight convulsive movements several times daily, and occasionally laughed aloud, as she did once in my presence. The pupils varied in size, though never small, and apparently not influenced by light, and she seemed to see nothing. Whereas in February the mirror was fixed during examination, it now excited no attention whatever, and it was easy to get a good view of the discs. They were sharply defined, gray, entirely without fine vessels, the central vessels rather small. The macular region and other parts of the fundus appeared as before, except that I could not now see any fine retinal vessels on the whitish zone.

By the mother's account this was her sixth child. The first four were healthy and strong. The fifth child, born some four years before this one, in Germany, had presented similar symptoms and died at the age of eighteen months, having wasted excessively after being weaned. After its death the mother came to America, was sick for a long time after her arrival here, then grew better and conceived, but was again sick during pregnancy. Since the birth of the child she had been fairly well. The father was healthy.

DISCUSSION.

DR. KNAPP.—The case which has been described is an exceedingly rare but very characteristic alteration in the eye-ground of infants. It is connected with a peculiar disease. The cases thus far recorded have all ended in blindness, followed by an early death. The affection seems to be connected with an arrest of development in the cerebral cortex, as Dr. Sachs, who made the post-mortem of the case which I have reported, tells me. The weak and apathetic child was taken to Long Branch, where it rallied somewhat, but the following winter it emaciated, became weaker and weaker, and when I saw it in May of last year it was almost completely paralyzed. The pupils were large and immovable; the optic discs, which when I had seen them last were only a little pale, were totally atrophic. Only traces of retinal vessels could be seen, but the opacity around the yellow spot had not changed.

The child died. Dr. Sachs will describe the condition of the cerebral cortex. I think that the ocular change is an imperfect clearing up of the central portion of the retina, which in its structure is very much like the cerebral cortex. If we meet with a case of congenital brain disease and find on ophthalmoscopic examination the picture which has been described, I think that we have warrant to pronounce the prognosis fatal.

DETACHMENT OF THE RETINA IN BOTH EYES WITH ALBUMINURIA OF PREGNANCY: REPLACEMENT OF RETINA.

BY O. F. WADSWORTH, M.D.,
BOSTON.

DETACHMENT of the retina is so infrequent in connection with the albuminuria of pregnancy, that I wish to place a case on record. The case is further interesting as presenting what is also quite unusual in albuminuric retinitis, very extensive choroidal changes.

Mrs. ——, twenty-seven years of age, was of rather delicate constitution, but generally in good health. She had a light attack of scarlet fever in the winter of 1885, which confined her to bed only two days, and for six months following the attack had occasional back-ache. She was married in the winter of 1886, and when I was called to her, early in March, 1887, was about seven and a half months pregnant.

Except that for a short time she had thought she was growing stout, probably due to a little œdema, no unusual symptom was noticed till February 23d, 1887. On that day œdema of the eyelids was observed, but excited no particular attention.

February 27th, she took a walk out of doors and got rather tired, and on the morning of the 28th complained of indistinctness of sight. As this continued and increased, Dr. C. P. Putnam was summoned on March 2d. There was then moderate œdema of eyelids and of legs; quite poor vision; the urine was loaded with albumen, and contained many hyaline and granular casts.

March 3d, I saw her in consultation. There was moderate œdema of the eyelids. The media were clear. There was slight haziness of the disc and all the posterior part of the retina in both eyes; the retinal veins were perhaps a little larger and darker than natural, but there was no marked change in the vessels, which were everywhere clearly seen. In the right eye there was a very general detachment of the retina, mostly with but a thin layer of fluid between it and the choroid; but well toward the equator outward the retina curved sharply forward and its vessels appeared quite dark.

At the macular region the refraction was some 5. D. less than at the disc; the retina here was not quite transparent, and showed, when accurately focussed, very faint parallel grayish lines; at the centre was a redder oval, not so red, however, as in the normal condition. In the left eye also was a detachment of the retina of considerable extent over the posterior part of the fundus, but of less degree than in the right. The appearances in the macular region were similar to those in the right. No attempt was made to measure the vision.

March 4th, pilocarpine nitrate, gr. $\frac{1}{6}$, was injected subcutaneously. This caused much sweating and salivation and some vomiting, and, as the directions given were misunderstood, Mrs. —— continued sitting up in bed for a long time and became much exhausted. The following night she had a good deal of headache. During the next two days she thought her sight better.

March 6th, the haze of the discs and the surrounding retina was somewhat greater, but the retina in and about the macular region was decidedly less prominent; indeed, in the left eye no detachment in this region could now be made out with certainty. Toward the equator, in the right eye there was a prominent detachment along the outer and lower parts; in the left, prominent detachment along the inner and lower parts. In the upper and inner equatorial region of the right eye, the upper and outer of the left eye, the retina was in place and of normal appearance. There were one or two small hæmorrhages in each retina. On hasty examination of the vision, words about equal to 2.25 Sn. were read.

March 7th, subcutaneous injection of pilocarpine was repeated.

March 8th, still more haziness of discs and retinæ, of faintly yellowish tint, but not enough to obscure the vessels materially. The central portion of the retina perhaps less prominent in the right eye, the grayish markings on this part (resembling the lines on a coarse lithograph) rather more distinct. The bulging detachment toward the equator was now wholly below the horizontal meridian in each eye. Right, words of Sn. 3. Left, words of Sn. 1.5.

March 9th, there was great œdema of one labium, to relieve which the patient lay flat on her back, and headache, which had generally been present in some degree since the 4th, was much more severe on the 10th and the following night, and vision became worse.

The morning of the 11th the opacity of the retina had increased in both eyes, and in the left eye there was a faint appearance of radiating stripes around the macula. In the right eye it was doubtful if there was actual detachment

in the macular region, and that in the lower equatorial region was less, but over a small space a little downward and inward from the disc the retina curved forward. In the left eye no detachment could be made out anywhere. Vision was decidedly less, but as it was thought this might be the effect of the headache, which still persisted, although not severe, it was tested again some hours later when the headache had passed off, and was then in each eye much as on the 6th.

The night of the 11th headache was again very severe. 2 P.M. of the 12th, examination with the reversed image only, while the patient was lying down, gave about the same condition as on the 11th.

Meanwhile, the urine had ranged from 40 to 50℥ in the 24 hours, except once, during which time pilocarpine was given, when it was 27℥, and the bowels had been kept free. It contained ¼ to ½% of albumen, broad and narrow hyaline, coarse and fine granular casts.

The afternoon of the 12th, consultation with Drs. Minot and Chadwick. There was now found a considerable amount of ascites, which had not been present twenty-four hours before. It was decided to induce premature labor. During the consultation slight pains had begun, and these were encouraged. About midnight there was a sudden convulsion. Ether was given, she was bled about 16℥, and delivered at 4 A.M. of the 13th. The child was got to breathe after considerable manipulation, and did well.

The mother convalesced slowly but uninterruptedly. Vision was at first very low; sixty hours after delivery she could see only movements of the hand in a shaded room.

March 26th. Vision had improved during the last few days, so that she could see that her baby was wrapped in a plaid blanket. In each eye the disc outline was indistinguishable, the whole posterior part of the retina gray, opaque, sprinkled with whitish soft-edged patches and small hæmorrhages; in the left were radiating stripes around the macula, somewhat more pronounced than on the 11th. No detachment could be made out in the left eye, but in the right, far downward, the retina bulged forward over a small area, on which the vessels

appeared very dark. In both eyes, well upward and laterally, the retina was transparent, and there were seen irregular pigment changes in the choroid, partly lighter, partly darker than normal.

April 14th, she saw, as she had for some time, "as through a moving veil, as of falling water," but much better. She read slowly at 10″ words about equal to Sn. 1.75. The eyes were not tested separately, but the left was evidently the better. L. F. of normal size. R. F. a little contracted above, in other directions normal. Right, disc outline rather indistinct; a few white spots about the macula, but the retina generally transparent; numerous and extensive changes in the epithelial and choroidal pigment, darkish patches extending across the macular region and smaller ones scattered widely over the fundus, also much absorption of pigment; far downward detachment of retina of small extent. Left, the appearance of the fundus was very similar to that in the right, but the choroidal changes, although numerous and extensive, were not so great, and there was no detachment.

Mrs. —— was last seen on May 7th, soon after which date she went to the sea shore. The discs were somewhat more defined, but in other respects the fundus was much the same as on April 14th, except that now no detachment could be discovered in either eye. R., J. 13 at 6″—8″; L., J. 5 at 6″—8″.

I have been informed that a slow improvement of sight has continued.

DISCUSSION.

DR. RISLEY.—I am very much interested in this subject of retinitis during the albuminuria of pregnancy. There are cases in which we are not justified in allowing the pregnancy to go on to full term. Last year I presented such a case, in which labor was brought on at the fifth month, and the eyes recovered so completely that I felt afterwards, and still feel, and so does the woman's husband, a very intelligent physician, that the procedure was thoroughly justifiable. The woman would unquestionably have been blind if the pregnancy had been allowed to go to full term, if indeed she had not lost her life.

During the present year another case has come under observation. Premature labor came on as the result of undue exercise during the seventh month. She was then so blind that she could only see the movements of the hand held between the eyes and the light. As in the case reported last year, there were many days of unconsciousness, and when intelligence was regained she was aphasic. In the course of from six to ten months, however, she had recovered so far that many of the letters of the test-card could be made out, and she carries on conversation, but with some difficulty. The interesting point is that the intense swelling of the optic nerve, the fan-shaped hæmorrhages and the snow-bank appearance have all disappeared.

DOUBLE CHORIO-RETINITIS, WITH PARTIAL DEGENERATION OF THE OPTIC NERVE, ASSOCIATED WITH CURIOUS LYMPH EXTRAVASATION INTO THE RETINA AND VITREOUS.

BY CHARLES A. OLIVER, M.D.,
PHILADELPHIA, PA.

J. M., a twelve-year-old school-boy, presented himself at St. Mary's Hospital for examination of the eyes. By careful and close questioning no special dyscrasiæ could be obtained, the family history being exceptionably good. The patient was healthy and strong, until five years ago, when he had an attack of diphtheria and paralysis, confining him to bed for three months, during which time he was unable to speak, and his eyesight became bad; this last condition persisting.[1]

He was well developed, intelligent, and of good stature. All of the obtainable deep and superficial reflexes of the trunk and upper extremities were normal. The patellar-tendon reflexes were almost abolished. Physical examination failed to reveal any other organic change. His urine was free from

[1] Details of the sickness related to me by the attending physician, Dr. W. W. Lamb.

albumen and sugar, and utterly devoid of any débris except a few epithelial scales; the specific gravity being 1020.

Both pupils were large (four and a half millimetres in horizontal diameters, upon exposure to diffuse daylight). The irides were mobile to light stimulus and accommodative action, but the left iris was sluggish. Centric vision for form with the right eye equalled one fiftieth of normal ($\frac{1}{50}$), whilst that of the left eye was one fifth, doubtful ($\frac{5}{2}$ —, the patient giving a slight twist of the head to obtain more accurate fixation); this not being sensibly improved by correction of error of refraction.

The ophthalmoscope showed in the right eye a peculiar brilliant lymph extravasation on the retina, extending out from the vessel-entrance on the disc to a large irregular area of choroidal inflammation; the mass having a gradual increase of elevation and thickness, as if by superimposed layers,—similar to those upon the back of an oyster shell,—from one-half dioptric at the vessel-entrance on the disc in advance of the surface of the disc, to two and a half dioptrics at the summit of the pyriform prolongation. The portions of the optic nerve in connection with this mass seemed to be entirely free from disturbance, until the point of greatest bulk of the extravasation was reached, where there was an underlying and surrounding area of unequal degeneration of choroid and retina, allowing the sclerotic to be seen. The retinal elements in the position of the fovea were seemingly destroyed. The nerve itself had undergone partial red-gray atrophy, whilst the retinal vessels,—especially the veins,—were diminished in size. The entire choroid appeared as if "black peppered"; this being more pronounced near the area of inflammation. The media were clear. Refraction showed a hypermetropia of one-half dioptric for the vessels at the long axis of the disc.

The left eye presented another stage of the same picture. The lymph extravasation had evidently broken loose, and was floating in the vitreous. It showed the same characteristic oyster-shell and silvery sheen-like appearance, but seemed smaller and filamentous (Fig 2, Plate 2). The macular region, which appeared somewhat lower than usual, was quite inter-

Plate 1. O.D.

N.K SCHWENK. DEL.

Plate 2. O.S.

Fig.2.

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esting; the fovea itself had, directly in its centre, a deposit of similar material, though somewhat browned, to that seen in the vitreous; this spot being partially bounded by a trace of sclerotic. Surrounding this, there was an area of retina, which was so thin as to be almost imperceptible, allowing the choroid to be plainly visible. This area was equal to the size of the macular region, and was utterly devoid of capillarity. The entire space was bordered by a well defined line of semi-transparent retina, which increased in density and thickness until it was lost in the general retinal haze. The nerve and retinal vessels were almost identical with those in the other eye. With the exception of the single vitreous opacity above noted, the media were clear. Refraction was the same as in the other eye.

The accompanying chromo-lithographs, which were made from water-color sketches by Dr. P. N. K. Schwenk, show these conditions very well.

The case is interesting, not only from an ætiological standpoint, where there may possibly have been a basilar meningitis with descending inflammation and partial atrophy of the optic nerves, with lymph extravasation into the interior of the ocular globes, or a localized intra-ocular lesion with cell proliferation into the vitreous; but is worthy of record in affording an ophthalmoscopic picture of a pathological change which may be considered as illustrative of a histological condition that is invisible in the ordinary methods of examination of the living eye,—that is, the appearance in the macular region of the left eye, resulting from the deposition of the foreign substance. Here the damage to the retina and choroid has not been so great as in the other eye; this most probably resulting from the lesser size of the mass having caused a lower grade of inflammatory action with consequent slighter plastic attachment. This want of strong attachment has permitted the mass to become dislodged and thrown out into the vitreous, carrying with it the greater part of the intervening band between the stump left protruding from the vessel-entrance on the disc and the remnant remaining in the fovea. The inflammation is, therefore, remarkable in appear-

ance, it having produced just sufficient change in the macular regio to allow the resulting condition seen to be used as a rough example of what is ophthalmoscopically invisible in the healthy eye, and which could only be recognized by much greater amplification. This picture cannot in any way be presumed to be representative of health, as we are here necessarily dealing with practically dead material, but can be considered merely as a pathological condition which so closely simulates the appearance of healthy material under greater magnifying power (which has not as yet been applied to the living subject), that it may be used as an additional means of study of the appearance of normal tissue.

A RARE FORM OF OPHTHALMIA GRANULOSA ASSOCIATED WITH ICTHYOSIS.

BY F. BULLER, M.D.,
MONTREAL, CANADA.

IT is, I believe, a generally recognized fact that certain cutaneous eruptions or morbid conditions are also met with on the conjunctiva. Eczema, pemphigus, lupus, lepra, and epithelioma have all been seen either as primary affections of the conjunctiva, or associated with similar conditions elsewhere. The comparative immunity of the conjunctiva from participation in diseases of the general integument would, however, be somewhat remarkable were it not for the obvious anatomical and functional differences between these two structures, circumstances which of themselves must materially modify any influence that tends to induce pathological changes in these parts.

The concurrence of certain well marked and characteristic changes in tissues or structures that have no direct connection with each other, except that they are naturally dependent on the same nutritive processes, is a matter of daily observation,

and I only allude to it as bearing on the pathology of the two cases I am about to present, both of which are the subjects of the skin disease known as icthyosis.

The affection of the conjunctiva is identical in each, so that one description will serve for both; but there are certain differences in their general condition which must be referred to separately.

The first case is that of a boy aged fifteen, who has had several attacks of rheumatism, and whom I treated two years ago for chronic iritis, from which he made a perfect recovery after some four months treatment. I did not at that time notice any disease of the conjunctiva, though I have little doubt that such existed even then. Six months later he was again brought to me on account of not being able to use the eyes without discomfort. An inspection of the eyelids then revealed the changes presently to be described.

He is the son of healthy parents, neither of whom have ever had any disease of the skin; four of their children are equally free from the same; but this boy and two of his younger brothers present that peculiarly rough and scaly condition of the skin of the legs and arms which belongs to mild forms of icthyosis. The skin is everywhere dry and harsh, the normal skin-lines, especially of the hands, are considerably exaggerated. In all three the changes are almost precisely similar, but rather more conspicuous in one of the younger brothers than in the patient.

They are all alike in being worse in the winter than during the summer. In early infancy they suffered from acute eczema, but for several years afterwards the mother, an educated and observant lady, states positively there was no evidence of skin disease, the present condition having developed gradually several years after birth.

In the winter season the skin of the face has a harsh stiff appearance and is more or less scaly, and there is a scaly and somewhat reddened condition of the edges of the eyelids.

The second case is that of a boy, eleven years of age, whose father has been subject to "salt rheum" for many years. Two of his brothers are similarly affected, but the mother is a robust healthy woman.

This child suffered much from acute eczema during the first year of his life, and has had several attacks since. His skin has never been really healthy in appearance, and for some years there has been an increasing accumulation of epidermic masses on certain parts of the extremities. The skin generally is harsh and rough, and its normal lines are everywhere increased; about the knees and elbows there is an enormous quantity of dark colored epidermis, subdivided by minute fissures into innumerable polygonal areas. This condition exists to some extent on the flexor aspect of the elbows. The skin affection is said to be even more conspicuous in the winter than in the summer season. The integument of the face is coarse-looking, tense and somewhat scaly, and there is a good deal of exfoliating epithelium on the scalp. The edges of the eyelids are slightly reddened, and there is a considerable quantity of dry epithelium about the roots of the eyelashes. The boy is well developed, and in other respects enjoys excellent health.

For two or three years at least the boy has been known to have weak eyes; all the other members of the family are said to be free from any such weakness. During the past month or thereabouts the eyes are said to have been weaker than usual, and there is a moderate intolerance of light. Beyond a perceptible hyperæmia of the ocular conjunctiva and a slight drooping of the eyelids, there is nothing abnormal in the external appearance of the eyes. Under atropine there is comp. hyperopic astigmatism $= + 1.50s. \supset + 2.50c.$ V. $= \frac{20}{20}$.

The conjunctiva of the lower lids is somewhat swollen, has a smooth and rather glazed appearance, and presents several longitudinal ridges, without any of the rounded bodies of follicular conjunctivitis or of trachoma. A long string of pale yellow, extremely tenacious mucus, occupies the lower retro-tarsal fold.

On everting the upper eyelids, the palpebral conjunctiva appears remarkably pale and also glazed, or as if varnished. The pallor is that of a grayish faded pink, with a more pronounced pink at the ends of the lids and along the posterior border of the tarsus.

The palpebral surface is somewhat more extensive than normal, and the entire eyelid perceptibly thickened. The conjunctival surface, though smooth, has a remarkably uneven appearance, owing to the presence of large numbers of flattened elevations which are separated from each other by narrow fissures. These elevations are quite irregular both in size and shape, varying from one to two millimetres in diameter; the larger and more rounded ones are at the posterior border of the tarsus, though even here their surfaces are distinctly flattened. Some, like minute mushrooms, are considerably broader at the surface than at their attached portion. Under a strong magnifying glass they all appear semi-transparent, almost gelatinous, and their faint red tinge is seen to be due to innumerable minute rusty red dots scattered throughout their substance; these dots are undoubtedly fine capillary loops, since they become larger and more numerous when the part is irritated by friction.

But their most striking characteristic is their extreme hardness; when incised strong pressure between the thumb nails fails to make the slightest impression on any but a few of the redder ones near the posterior edge of the tarsus. Some of the latter I succeeded in crushing in this way.

Two of the largest, near the posterior edge of the tarsus, were removed for microscopical examination. Sections made through these unfortunately did not demonstrate the condition of the epithelium or its relations with the underlying structures. They did, however, clearly show that the excised granulations were made up of highly developed granulation tissue, containing a very large proportion of white fibrous tissue in the form of wavy bands, and in parts the cellular elements preponderating. Vertical sections showed an abundance of fibrous tissue in the superficial as well as the deeper portion of the granulations. While the general characters of these structures correspond to that of ordinary trachoma, their connective tissue elements were greatly in excess, as might safely have been predicted from the macroscopical features already mentioned.

No microscopical examination was made of the first case,

but it was in all respects so nearly the counterpart of the one examined that I have no reason to doubt the granulations would have been found identical in their minute structure had such an examination been made in both.

In the second case no special treatment was prescribed, but in the first various remedies known to be efficacious in the treatment of trachoma (especially the sulphate of copper) were tried faithfully for nearly a year, but without the slightest perceptible benefit, as far as the size and number of the granulations or the appearance of the conjunctiva was concerned.

I have, among hospital patients, several times seen cases of trachoma precisely similar to these, and always equally rebellious to treatment; but I do not remember ever having examined the state of the general integument in any of these, and am therefore unable to say whether any chronic skin disease was associated with these also.

It is very evident, however, that the two cases I have just described differ widely from the ordinary forms of trachoma.

(1.) They differ in the form, size and color of the granulations, and especially in the extreme hardness of these structures.

(2.) In the absence of any tendency to inflammatory exacerbations. The first case, though under observation for more than a year, never at any time showed any change in the condition of the conjunctiva. The second case, though evidently of several years duration, had never at any time shown the least tendency to acute exacerbations, nevertheless it had already arrived at what would under ordinary circumstances be regarded as a very advanced stage of the disease.

(3.) The first case differed from ordinary trachoma in its absolutely passive behavior under the ordinary treatment.

(4.) The character of the secretion was not that of any ordinary form of trachoma, but rather such as we sometimes see in commencing parenchymatous xerosis. But in these cases atrophy of the conjunctiva was not a conspicuous symptom. Indeed, the retrotarsal folds and fornix were almost healthy in appearance.

(5.) That they were non-contagious is almost certain.

The pathological changes, it will be seen, were confined chiefly to the palpebral conjunctiva of the upper eyelids. Now this is just the part of the conjunctiva that in its anatomical structure bears the greatest resemblance to the general integument, which we have seen was also subject to certain chronic changes analogous to those in the conjunctiva. If, as seems probable, the two conditions really depend on the same error in the state of general nutrition, they may, on taking the above facts into consideration, be regarded as identical in all respects excepting in situation. For this peculiar form of trachoma, then, we might perhaps be justified in employing the designation Icthyosis of the Conjunctiva.

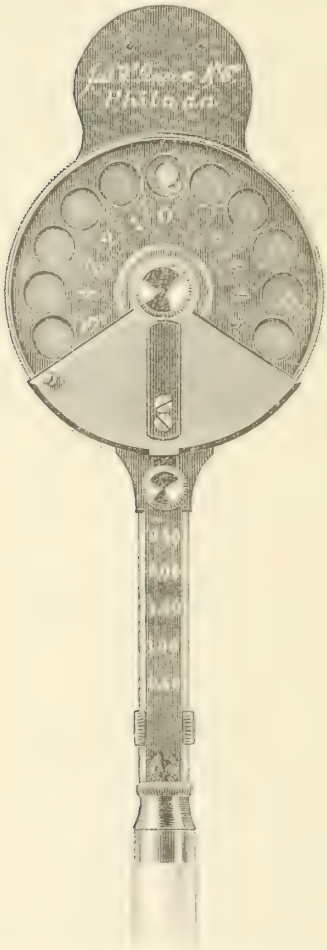
The obvious relation, which these cases seem to indicate, of eczema and icthyosis, naturally suggests a question in pathology which we may leave to the dermatologists for answer.

A MODIFIED FORM OF OPHTHALMOSCOPE, WITH CYLINDERS.

BY S. D. RISLEY, M.D.,
PHILADELPHIA, PA.

IN the daily routine of ophthalmoscopic work, I have often felt the need of a series of cylindrical lenses in addition to the usual convex and concave sphericals. I therefore have had constructed by Queen & Co., of Philadelphia, an instrument which furnishes a wide series of sphero-cylindrical and simple cylindrical glasses. It has proved to me a very great convenience, and I have therefore thought it of sufficient moment to present to the Society. The well known Loring refraction ophthalmoscope, with its series of lenses unchanged, has been retained as nearly as possible in the construction of the instrument. To it has been added slides, as in the

instrument presented to the Society by Dr. Jackson in 1885. Instead, however, of the spherical lenses of that instrument, the following series of convex cylinders have been substituted. In slide A. + .50 + 1. + 1.50 + 2. + 2.50. In slide B. + .25 + 3. + 4. + 5. + 6. By their superposition .25 D. intervals are secured up to 3. D., and .50 D. intervals up to 8. D.



It is obvious also that this series of cylinders can be combined with all the spherical series with .50 D. intervals, thus securing any required combination. The cylinders are convex, with their axes parallel to the stem of the instrument. The direction of the axis can be varied sufficiently for all practical purposes, by inclining the axis of the instrument. This will not be convenient where the axis of the correcting convex cylinder is required at 180° (horizontal), or the concave cylinder at 90° or thereabouts; but these cases are exceptions to the general rule, and even then the handle of the instrument can be held in a horizontal position. The concave cylinders, with axes horizontal, are secured by combining the convex cylinder with a corresponding concave spherical, and crossed cylindrical values by sphero-cylindrical combination.

A MODIFICATION OF THE REFRACTION OPHTHALMOSCOPE, WITH AN ATTACHMENT FOR USING CYLINDRICAL LENSES.

BY SWAN M. BURNETT, M.D.,
WASHINGTON, D. C.

THE fundus of an astigmatic eye, when observed by the ordinary direct method of ophthalmoscopic examination, is seen under the distorting influence of the irregularly refracting media. This is an evident disadvantage, for it is very often a matter of moment to be able to study the details of the fundus of such eyes in the most scrutinizing manner. To see the fundus as it is, it must be observed through the cylinder which corrects its astigmatism. Several efforts have been made for furnishing refraction ophthalmoscopes with the required cylindrical lenses, altogether, however, I believe, in the form of additional discs (Parent, Uhthoff, and others); though Dennett, of New York, once suggested a very small Stokes lens to be placed behind the perforation in the mirror.

Some time ago a patient with a high degree of astigmatism came under my care, and a minute examination of the details of the fundus was very necessary. I fastened the correcting cylinder from my trial-case to the back of my refraction ophthalmoscope by means of a rubber band, and found it so satisfactory in its operation that I at once set to work to devise some more convenient and elegant appliance to take the place of my rude and primitive contrivance. The instrument, in its present condition of development, I now have the honor of offering you for examination. It consists of a clip for holding the cylinders of the trial case, which is fixed on the back of the instrument, upon the revolving discs containing the spherical lenses (Fig. 1). The direction of the axis of the cylinder is indicated on a graduated scale marked on the

back of the mirror plate. We have thus at our command for ophthalmoscopic examination all the cylindrical lenses which we use in the subjective determination of astigmatism, and are not restricted to the limited number contained in a small additional disc. The clip is very light, adding but little to the weight of the instrument, which is otherwise even lighter than the ordinary refraction ophthalmoscope, and is not at all in the way when not in use, and is much less cumbersome than an additional disc would be.

Fig. 1.

For the primary diagnosis of astigmatism this instrument has probably no advantage over the methods ordinarily in use, but for the verification of doubtful diagnoses in difficult cases it has a value, and in my judgment, based on the use of it for several months, one of no mean importance; and to the practical refractionist I have no need to apologize for offering still another means of checking our findings by other methods, no one of which is entirely free from defects and liabilities to error.

The instrument as now constructed has, I believe, still other practical advantages to which I would here call attention. By placing a second disc containing four additional lenses over the large disc holding fifteen lenses, we are enabled to bring into use, singly and by combination, forty-seven numbers for the determination of ordinary spherical ametropia. This is effected in the following manner.

In the large circular disc there are one free aperture and fifteen lenses, as follows: + 0.5, 1., 1,5, 2., 2.5, 3., 7.; — 0.5, 1., 1.5, 2., 2.5, 3., 7., 13. In the second disc there are a free aperture and + and — 3.5 and 7.5, which by combination respectively with those in the first disc give the following additional numbers: + 3.5, 4., 4.5, 5., 5.5, 6., 6.5, 7.5, 8., 8.5, 9., 9.5, 10., 10.5, 14.5; and — 3.5, 4., 4.5, 5., 5.5, 6., 6.5, 7.5, 8., 8.5, 9., 9.5, 10., 10.5, 14.5, 16.5, 20.5.

It will be seen from an examination of these numbers that we obtain a series up to + and — 10.5 D. with a regular interval of 0.5 D., and higher numbers up to + 14.5 D. and — 20.5 D. with intervals of from 1.5 to 4. D.

In some other instruments of a similar character, and containing as large a number of lenses, there is a glass of 0.5 D. which can be used; but the interval between *successive* numbers is always 1. D. The refined diagnostician wants something rather more delicate than that, particularly for the lower numbers, and it has been the purpose in the construction of this instrument to supply the most fastidious with the smallest interval which can possibly be used to advantage.

There are some changes in the ordinary arrangement of the mirror that, I think, cannot fail to commend themselves to the practitioner. The superiority of the tilting mirror, particularly in the form introduced by Loring, is now, I believe, recognized by all. But it is equally certain that these instruments are still defective in that they have no plane mirror, and the narrow tilting mirror cannot be used to advantage in making the shadow-test.

The advantages of the plane mirror in examining for fine opacities in the media, and for other purposes where a weak illumination is necessary, are so apparent to the practical ophthalmoscopist as to render more than their mere mention unnecessary.

The shadow-test has already acquired such a foot-hold in this country, that it is safe to say that any ophthalmoscope which pretends to completeness must furnish a means for using it. As is well known, this test can be made by means of a plane mirror, which, in fact, is by some, myself among the number, preferred to the concave form.

To provide for these necessities in the most convenient manner, I have had an ordinary plane mirror, 55 mm. in diameter, fixed to the mirror plate, and swung *in front* of this a concave tilting mirror (Fig. 3). When the tilting mirror is in use the

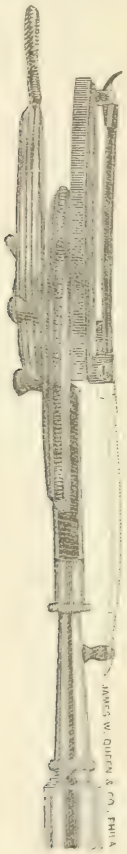


Fig. 2.

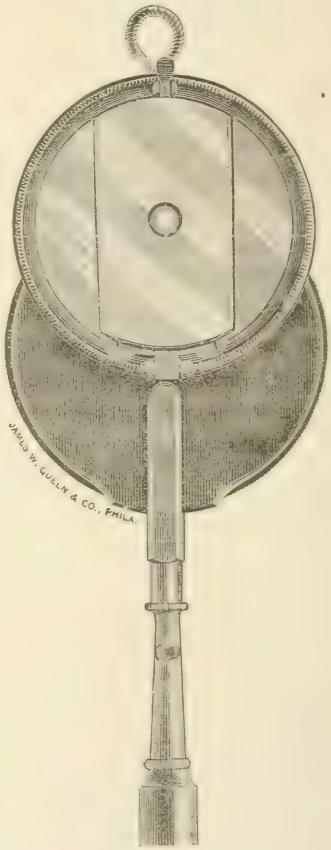


Fig. 3.

plane mirror behind interferes not in the least with its action; and when it is desired to use the plane mirror alone, the tilting mirror is easily detached by the thumb nail from its upper bearing, and falling down from in front of the plane mirror, hangs from the ball and socket joint of its lower bearing (Fig. 2).

It is thus seen, that while laying claim to no original ideas, I have endeavored to combine in one instrument the practical advantages of most of those ophthalmoscopes which have attained to favor on account of their excellences in some particular point or points.

The instrument is provided with the auxiliary lenses of two and three inches focal distance respectively, which are, in my experience, the most useful for examination by the indirect method; and the case is sufficiently long to allow the instrument to be laid in it without unscrewing the handle, an advantage not so trivial as might at first blush appear.

The instrument is made by Queen & Co., of Philadelphia, which is a sufficient guarantee for its mechanical and optical excellence, and its price is $25.

NOTE.—It may not be amiss to state that this present instrument is an improvement upon the one described in my *Treatise on Astigmatism*, p. 100.

DISCUSSION.

DR. WADSWORTH.—I wish to add my testimony to the value of a clip behind the mirror. Some ten years ago I had one made to fasten behind the ophthalmoscope to hold the lenses of the test case, and have found it often very useful.

DR. JACKSON.—The simplicity of Dr. Burnett's clip, and the simplicity of Dr. Risley's plan for adjusting the cylinder axis, are points that strike me favorably. The criticism applies to most ophthalmoscopes fitted with cylindrical lenses, that more lenses are used than are of practical importance. From our experience in refraction, we know that a certain amount of astigmatism will cause less indistinctness of vision than an equal amount of myopia or hyperopia. I think that the proportion is about one to two, *i.e.* astigmatism of 2. D. will not cause more than one half as much blurring as myopia of 2. D. From this fact, and because we have found that 0.5 D. is about the smallest interval of practical value in the spherical series of the refraction ophthalmoscope, I think that 1. D. would be the smallest interval of practical importance in the series of cylindricals. It seems to me that a single slide containing concave cylinders of 1., 2., 3., 4. and 5. D., with their axes perpendicular to the stem of the instrument, would answer all purposes. I would suggest the concave lenses, because it is much easier to determine accurately the refraction of the

meridian of greatest hyperopia, or least myopia, than it is to determine the refraction of the other principal meridian. With the concave cylindricals, after determining the first meridian accurately, by bringing up the proper cylindrical lens, the whole fundus would be rendered distinct.

I think the Loring ophthalmoscope would be greatly improved by adding the two slides, as Dr. Risley has done, and using one of them for the series of cylindrical lenses I have just suggested, and the other for the spherical lenses now placed in the accessory quadrant, and doing away with the quadrant altogether. This would make the instrument lighter and thinner, give it a sufficient series of cylindrical lenses, and make it possible to use every lens or combination of lenses without taking it from the eye.

DR. DENNETT.—Dr. Burnett has referred to the fact that I used a Stokes lens back of the mirror. I used it considerably; but I have since discarded it. The Stokes lens as fastened on had no disadvantages, but it was not worth while to have it. I was talking with Dr. Callan, and I found that he had had one which was very convenient; but I think that he does not use it very much.

As a matter of scientific interest, it is desirable to see the bottom of the eye just as it is; but the cases are rare where it is necessary to do this in order to make a diagnosis or give correct treatment.

DR. RANDALL.—At the last meeting I presented an ophthalmoscope with cylindrical lenses, which I had used for two years. The cylindrical lenses have been in daily use; and at the University Hospital and elsewhere the instrument has proved useful in other hands besides my own.

DR. GREEN.—The Society should not forget that in 1869, at the same meeting at which Dr. Loring exhibited his first refraction ophthalmoscope, Dr. Henry D. Noyes exhibited to this Society an instrument consisting of three clips with a handle, one clip hinged for the mirror, one for a spherical lens, and the other for a cylindrical lens. The principle of the arrangement now shown by Dr. Burnett was thoroughly worked out, eighteen years ago, in this invention of Dr. Noyes. It is described and figured in the Transactions for 1869.

DR. BURNETT.—I have made no claim to originality. After perfecting this arrangement, I heard that Dr. Noyes had made some such improvement, but I did not find it in any of the numbers of the Transactions which I have. All these arrangements are only modifications of the old Jaeger ophthalmoscope. They are simply more convenient.

TRIAL SET OF SMALL LENSES, AND A MODIFIED TRIAL-FRAME.

BY EDWARD JACKSON, M.D.,
PHILADELPHIA, PA.

IN the trial set to which I call attention, *the lenses are twenty-five millimetres in diameter.* This is large enough for all practical purposes, and makes this one much lighter than the ordinary trial set. Theoretically, for lenses of the same number the gain would be least in the weakest lens, and most in the strongest; yet for the former, the small lens is less than half the weight of the ordinary lens. By actual trial, these smaller lenses, in a more substantial and proportionately heavier mounting, are found to weigh from one fourth to two thirds as much as the Nachet mounted lenses. The same is true of prisms; while discs, colored glasses, etc., are reduced in weight one half.

The spherical lenses are *plano, instead of double convex and concave.* This reduces their necessary spherical aberration, and admits of their more convenient combination. By placing the plane surfaces in contact, two lenses are readily held in one groove of the lens-holder. And in using them to test lenses by neutralization, the curved surfaces can be accurately brought in contact throughout. This can only be done for one of the curved surfaces when the neutralizing lens is double convex or concave, leaving a very perceptible incompleteness of neutralization, with which we are all familiar, in the case of strong lenses.

Additional lenses are introduced, including convex and concave, 3.25 and 3.75 D.; spherical and cylindrical, and 6.5 and 7.5 D. spherical, and concave 25. and 30. D. spherical; also the five eighths (0.62) dioptre and one and one eighth (1.12) dioptre lenses. Of these latter it may be remarked, that one

accustomed to the inch system of numbering misses among the metric lenses any exact equivalent for the $\frac{1}{36}$ and $\frac{1}{48}$ inch lenses, therefore these are sometimes added to the metric trial set. In thus adding to the metric series, I think the simplicity of the system should be carefully preserved by making the interval between them and the next lenses of the series one eighth dioptre, an exact divisor of the interval previously adopted. The complete series for the first dioptre, with this one eighth dioptre interval, would be 0.12 (or, more exactly, 0.125, which is objectionable because liable to be confounded with 1.25), 0.25, 0.37, 0.50, 0.62, 0.75, 0.87, 1.

Astigmatic lenses have been added. The astigmatic lens, as described by Stokes, has with regard to one axis the action of a convex cylindrical lens; and with regard to the axis perpendicular to the former, the action of a concave cylindrical lens, of equal refractive power. Such a lens is made by combining either convex or concave cylindricals, of equal refractive power, with axes perpendicular; or a spherical of one kind with a cylindrical of the other kind of twice the strength. The two used in this case are:

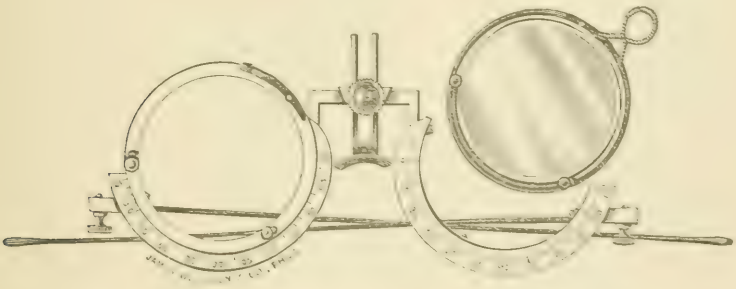
$$-0.25 \text{ sph.} \bigcirc + 0.50 \text{ cy.},$$

$$\text{and } -0.50 \text{ sph.} \bigcirc + 1 \text{ cy.},$$

of which the former is the most generally useful. For two years I have employed such a lens to hold in front of the approximate correction, to determine if a cylindrical lens, or a modification of the cylindrical already chosen will improve it: and it is far more useful, and far more used, than any other one lens in my trial set.

For illustration, suppose a case in which the best vision obtainable with spherical lenses is $\frac{2}{3}$ partly, with a + 1.50 D. lens. To try if this can be improved upon, put before it an astigmatic lens, and revolve its axis over a semicircle. If regular astigmatism of practical importance be present, vision will improve with the axis turned one direction, and be worse with the axis at right angles to this. Suppose it best with the axis at 90°. Remove the first lens and substitute + 1.25 $\bigcirc$ + 0.50 cy. ax. 90°. Vision is improved to, say, $\frac{2}{3}$ full. Again try the astigmatic lens, with its axis first at 90°, then

at 180°; if it blurs the test-type equally in both directions, no improvement of vision will be obtained by further change in the strength of the cylindrical. The spherical may then be varied, and perhaps we find + 1 sph. ⌒ + 0.50 cy. ax. 90° gives vision = $\frac{2}{1}\frac{0}{0}$. To show the advantage of the astigmatic over the simple cylindrical lens for this purpose, suppose in this same case we had held a + 0.50 cy. before the + 1.50 sph. Whatever direction it might be turned it would almost equally tend to blur the test-type. With the axis at 90° it would over-correct by 0.50 D. a meridian before perfectly corrected, while at 180° it would have doubled the over-correction of the meridian previously over-corrected. And if there were any choice between the two it might be in favor of the latter, so that the indications obtained by its use would be altogether misleading. Of course, in this case one could get aid from a concave 0.50 cylinder; but the astigmatic lens always improves vision with its axis in one direction, and makes it worse with its axis perpendicular to that direction, if uncorrected astigmatism be present.



To provide room for these additions without increasing the total number of lenses in the set, some of the highest numbers are represented by a single lens instead of a pair. These stronger lenses are used much more rarely that the new ones I have introduced, and they are still represented in the set; so that these changes are a clear gain to the practical completeness and value of the set.

Diminishing the size of the lenses enables us to greatly diminish the weight of the *trial-frames*. To be as rigid, a large ring must be much thicker than a small ring. So without sacrificing strength, but rather gaining it, the frames for this set of lenses (see Figure) have been reduced in weight to about 27 grammes; less than half the weight of the Nachet frame.

There is another point worthy of especial attention. When trial-frames are on the face, the most convenient direction to introduce or remove glasses is directly toward the temporal side. Here the frames reach the margin of the face, and there is a natural depression at the outer angle of the orbit. In other directions the glasses must be carried before the face, and over the frontal, malar, or nasal prominences. But in the frames made heretofore this natural passage for the lenses has been blocked by the attachment of the temple at this point. In Nachet's frames, the back lens must be slipped up from below; in Javal's, Randall's and others, it is slipped in from above; in Armaignac's and frames like it made in this country, the whole front of the frame swings up and forward; in Fox's, each carrier turns forward about a vertical axis. I propose simply to leave the natural passage clear by attaching the temple to the lower part of the lens carrier. Trial has confirmed the advantages of this plan, and demonstrated its freedom from disadvantages. Introducing the back lens above the temple, it rests securely in its hooks, without need of a special retaining spring; and the spring needed for the front, or cylindrical, lens is different from that common to Nachet's and several other frames, and, it is believed, less liable to get out of order.

The trial set and frames are made by James W. Queen & Co., of Philadelphia.

ON A TRANSIENT MYOPIA OCCURRING IN CONNECTION WITH IRITIS.

BY JOHN GREEN, M.D.,
ST. LOUIS, MO.

AT the beginning of convalescence from an acute attack of double iritis in the summer of 1867, I noticed that the impairment of distant vision was not entirely due to impaired transparency of the media; but that vision at a distance of twenty feet was greatly improved by concave glasses of about $\frac{1}{24}$. As convalescence advanced it was observed that weaker concave glasses sufficed to raise the acuteness of vision to its maximum, until, about two months from the beginning of the attack, V. had become normal, and the refraction had returned to its previous condition of Am. = *circa* $\frac{1}{40}$, M_0 vertical, in each eye. In other words, my refraction measured M. $\frac{1}{24}$ + Am. $\frac{1}{40}$ just after the height of the attack, and under full mydriasis from atropia, and fell gradually, during the following six weeks, to Am. = $\frac{1}{40}$. There was no appearance of synechiæ at any stage of the inflammatory affection.

Such measurements as I have since made upon patients convalescent from iritis have generally shown a similar myopic change, amounting at first to 1. D. to 1.5 D., and gradually falling off to zero in the course of from a month to six weeks. In a few cases only has this symptom appeared to be wanting.

In the latter part of April of the present year (1887), after entire freedom from any inflammatory affection of the eyes for about twenty years, I was again attacked with iritis; this time in the left eye alone. Three weeks after positive symptoms of iritis had declared themselves, and after the media had manifestly begun to clear, I observed and measured an excess of refraction, in the left eye over the right, equal to 1.5

to 1.75 D. This difference continued practically unchanged for about ten days, and only after all hyperæmia had disappeared, and the instillation of atropia had been abandoned, did it begin to show any appreciable diminution. Three weeks later a fixed star was still seen as a small circle of confusion when viewed through — 1. D. cyl., ax. horizontal; in the course of another week the refraction was equal in the two eyes, as had been the case immediately before the attack. As in the previous attack, the refractive change appears to have been a transient myopia of 1.5 to 1.75 D., superinduced upon a permanent myopic astigmatism of 1 D., M_0 vertical.

I desire, at this time, simply to call attention to this symptom, without offering any speculations as to the manner of its production.

DISCUSSION.

DR. WADSWORTH.—I never had the privilege of observing iritis in myself, but I can confirm Dr. Green's observation with regard to occurrence of temporary myopia during the convalescence from iritis. This I have seen not infrequently. Patients who have had no myopia before, have had their vision improved by concave glasses, both while under the influence of atropine and after its effect has passed off. The myopia has gradually grown less, until no glasses were needed. This, however, does not occur in every case.

A CASE OF RAPID DEVELOPMENT OF LENTICULAR OPACITY.

BY B. ALEX. RANDALL, M.D.,
PHILADELPHIA, PA.

I SHOULD like to speak of a case which has interested me very much. A young man, 22 years of age, myopic 2.5 D., came under my care in the spring, with a history of a cloud coming before his right eye, which had appeared ten days before. He had previously been free from trouble, and vision had suddenly decreased. I found a certain amount of choroidal trouble, but the point of interest was a posterior polar opacity. Never having seen such an early symptom, I discountenanced the idea that it was a recent formation. I had occasion, during the next six weeks, to witness a series of changes in this posterior opacity which made it seem very probable that it was a recent lesion. It began as a six-armed cross with rectangular arms, and appeared, by transmitted light, as a delicate lace-work. It became more extensive—each arm became double-pointed; and soon these were obscured by a like opacity in the anterior portion of the lens. This occupied some six weeks. During this time there had occurred a marked opacity of the lens without traumatism, and with only a moderate degree of choroidal inflammation, as evidenced by pain and other subjective symptoms; and, as far as I could determine, there had been no special increase in the degree of myopia.

APPENDIX.

NOTE TO DR. ROOSA'S CASE OF AMAUROSIS AFTER THE ADMINISTRATION OF LARGE DOSES OF QUININE.

SINCE reporting the above case, I have had an opportunity of re-examining the patient. The condition of to-day explains some of the phenomena, and, I think, takes the case out of the category of quinine amaurosis. The patient is now married; she is in excellent health, and has had no malarial symptoms for the past summer, not having lived in a malarial district during the hot weather. Her vision is: R. $\frac{20}{40}$, L. $\frac{20}{40}$. She miscalls some letters. With both eyes, V. $= \frac{20}{30}$. The fields are concentrically limited, but only moderately so. There is a large crescentic scotoma in the left eye; and in the right, while no actual scotoma exists, the perception is not so good from 20° to 50° as in the other parts of the field external to the circles thus marked. The color perception is feeble, especially for *green*. The optic papillæ remain very white; the vertical arteries of the disc are smaller, the veins of fairly good size. There are several smaller vessels on the papillæ.

The character of the visual field is thus seen to be very different from that of those cases of quinine amaurosis that have as yet been published. It will be remembered that the patient, when first seen by me, saw better in the periphery of the visual field. This condition, as shown by the scotoma, remains to some extent the same to-day, October 25, 1887.

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